DECEMBER
1949

Chemical Engineering

WITH CHEMICAL & METALLURGICAL ENGINEERING

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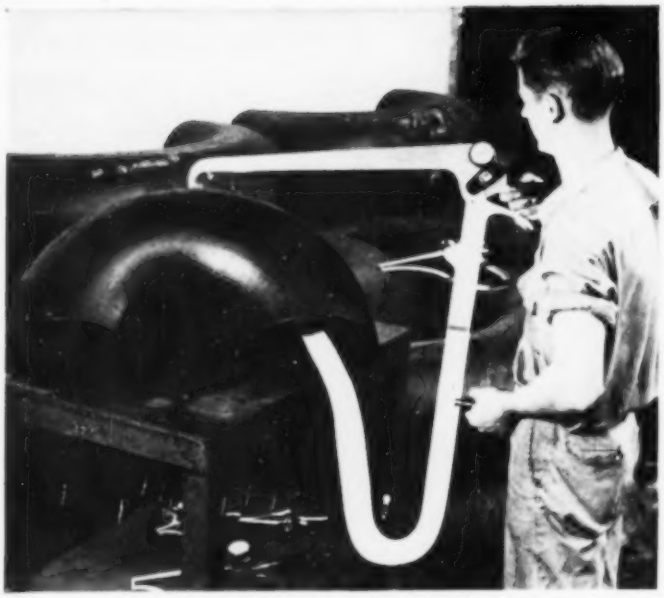

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PACIFIC PROCESS INDUSTRIES **PPI** *A Section of Chemical Engineering*
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PACIFIC EDITION, CHEMICAL ENGINEERING . . . . PACIFIC COAST EDITOR: J. V. Hightower, *San Francisco* . . . . EDITORIAL ASSISTANT: Kathleen Hurley, *San Francisco* . . . . SPECIAL CORRESPONDENTS: W. S. Shamban, Kenneth D. Kahn, Jr., *Los Angeles*; Ray Bloomberg, *Seattle* . . . . MANAGING EDITOR: L. B. Pope, *New York*

Weyerhaeuser's Efficient Mill

The new Springfield, Ore., operation of the Weyerhaeuser Timber Co., consisting of a kraft pulp mill, sawmill and power plant, symbolizes the large-scale and permanent transition from the traditional one-product plant designed to receive and process logs suitable only for lumber, plywood or pulp as individual products.

Logs of nearly all species, sizes, grades and quality can be used at the new manufacturing center, because all will have an outlet either as container board paper, lumber or power plant fuel. The sawmill, pulp mill and a power plant are linked by a conveyor system which obtains maximum recovery of every bit of wood, sawdust, bark and planer shavings. Bark-free slabs, clean cants and edgings not suitable for lumber production are ground into chips to feed the digesters of the kraft pulp mill, which is of 150-ton capacity.

The Springfield sawmill is Weyerhaeuser's, and probably Oregon's, first to be designed and built without the familiar giant, cone-shaped trash burner characteristic of most western lumber mills and a symbol of wood going to waste.

So complete is the recovery of byproduct clean and sound wood from the sawmill that the power-generating boiler plant probably will be starved for hogged fuel. Bark, sawdust and other raw wood not suitable for lumber or pulp will satisfy only about 60 percent of the boiler plant's need. Domestic fuel oil and hog fuel from other sawmills in the vicinity will be needed to complete the supply.

The kraft mill is Weyerhaeuser's second, the other being at Longview, Wash., and the second kraft mill in the state. A system of recovery of chemicals from the effluent has been worked out so that no harmful byproducts need to be disposed into the McKenzie River.

The mill was laid out and equipment specified by O. C. Schoenwerk, Chicago consulting engineer, who designed Weyerhaeuser mills at Longview and Everett, Wash. This is Weyerhaeuser's first pulp mill to manufacture its pulp into paper. Equipment ranges from the Carthage chippers in the wood room to the Camachine 19 winder in the machine room. The paper machine produces a continuous sheet 146 in. wide.

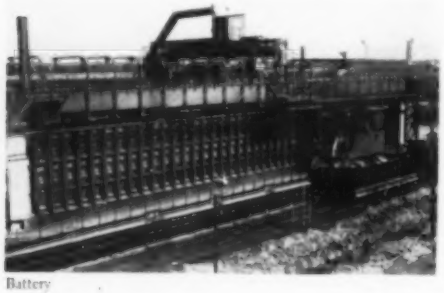
The pulp mill chippers have eight sources of chippable wood: three rubber belting and chain conveyors from the sawmill for miscellaneous trimmings, slabs and large cants; one slabwood deck for trucks; the log haul from the log pond; long logs from trucks; short logs from farmers; and mill waste feed from rail cars and trucks. This integrated receiving station for wood in all forms, sizes, grades and species is of major significance in the Eugene-Springfield area, where a heavy concentration of sawmills, remanufacturing plants and plywood plants produces a large tonnage of leftover sound wood suitable for kraft pulping.

Black liquor from cooking is roughly 85 percent water but, after concentration by boiling in evaporators until the water content is 35 percent, it can be atomized and burned to generate steam. When concentrated black liquor is burned, the chemicals it contains—a combination of sodium polysulphides and sodium carbonate—fall to the floor of the furnace and are drained off as red hot smelt into a tank of water where they are quenched and dissolved. This solution, called "green liquor," is clarified and causticized with lime. The resulting solution, known as "white liquor," contains sodium polysulphide and sodium hydroxide; lime settles out as calcium carbonate. The white liquor is clarified and used again as cooking liquor in the digesters. The calcium carbonate sludge is washed and burned in a rotary kiln to quick lime.

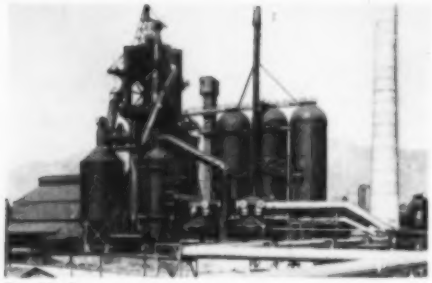
The Bergstrom tower, invented in Sweden and used under license, is used for the first time in the West to assure a contamination-free effluent discharge into the McKenzie River. Condensates collected in the process, which could have odorous gases dissolved in them, are collected and sprayed into the tower counter-current to furnace stack gases. Dissolved gases in the condensates are stripped out and carried up in the stack, leaving nothing but relatively pure water.

The Sven Pederson Saveall is used to process the water used to transport pulp stock to the paper machine and then drained away when the sheet of paper is

formed. This process operates on the principle that pulp fibers will float in water which has alum and glue mixed in it, if sufficient air clings to the fibers. Fibers from the sheet of paper are skimmed off the top of the water and reclaimed. The underflow or clarified water has less than 0.2 lb. of fiber per 1,000 gal., an amount accepted by the Oregon Sanitary Commission as harmless to fish life.



Battery



Bess No. 2

Coke and Iron

A new battery of 45 Koppers-Becker byproduct coke ovens is on stream at the Fontana, Calif., plant of Kaiser Steel Corp. to take care of increased coke requirements resulting from the blowing in of a second blast furnace. The ovens constitute a 50 percent increase in coking capacity and byproduct chemicals at the Fontana installation, where 90 similar older ovens are rated at 344,000 net tons of coke annually.

The blowing in of Bess No. 2, the new blast furnace (named after Mrs. Henry J. Kaiser) raises Fontana's pig iron capacity to 2,400 tons per day; it doubles the pig iron capacity of the West Coast.

Monsanto Adds to Adhesives

Monsanto Chemical Co., Western Division, has chosen Santa Clara, Calif., as the site for an expansion of its adhesives output on the Pacific Coast. Now making casein and soybean glues at Seattle and synthetic resin glues at Vancouver, B.C., Monsanto has acquired property at Santa Clara to manufacture a line of synthetic bonding resins and specialty coatings. An investment of around $500,000 is contemplated. At least eight acres is involved. Construction is expected to begin at once.

Hercules Eyes Western Woods

A 2-yr. program of small-scale chemical studies of certain Pacific Northwest woods, has convinced Hercules Powder Co. that operations on a pilot plant scale in the Northwest are imperative. The company will build its pilot plant at Klamath Falls, Ore. Hercules has bought from Weyerhaeuser Timber Co. a tract of 50 acres or more, which indicates that the buyer contemplates moving from the pilot plant stage to the construction of a commercial-scale plant.

The purchase includes a power house, some small buildings, railway sidings, fire lines and a water tower.

A. E. Forster, a director of Hercules, says that his company, in the pilot plant work, will draw upon practical experience in the extraction of chemicals from pine wood in the southeastern part of the U.S. This suggests, although the idea has not been confirmed, that the company is taking a look at the pines of the Northwest.

Hercules now has several operations in the West. At Portland, rosin size is manufactured from rosin brought in from outside the western region. At Hercules, Calif., the company is producing ammonia, nitric acid, ammonium nitrate and ammonium sulphate. The company makes explosives at Bacchus, Utah.

Union Starts Big Lube Unit

In its expanding refinery at Oleum, Calif., Union Oil Co. of California has put into operation a large unit for the manufacture of lubricating oils by the Duo-Sol solvent refining process. Capacity is about 6,000 bbl. per 24 hr. Approximate total cost of the project, which Fluor Corp. of California erected, was $3.3 million.

Raw material charged to the unit is San Joaquin waxy straight-run residuum of 15 deg. API, a heavy oil produced in the refinery from San Joequin crude oil. Processed in the unit, the oil is subjected to treatment to remove asphaltic and naphthenic constituents prior to later refining into finished lubricants.

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Local Color

Pittsburgh Plate Glass Co. expects shortly to sign contracts for the construction of an ultra-modern paint plant at Torrance, Calif. The unit will cost approximately $1,250,000, according to E. D. Griffin, vice president in charge of Pittsburgh's paint division.

The plant should be ready to go into production within 10 to 12 months. Preliminary building design was by Pittsburgh paint division design specialists—final blueprints by Albert C. Martin & Associates, Los Angeles architects.

Located about 15 mi. from Los Angeles, the plant will be erected on a 15-acre site. Original equipment will permit production of 1,500,000 gal. annually. Sufficient floor area for additional equipment is available to boost capacity to 2,600,000 gal. in the future.

Essentially a one-story earthquake resistant structure, the building will have a second-floor center section designed for loading ball and pebble mills. Mixing of pigments for roller mills and screening of the raw materials into filling hoppers will be done on the second floor.

A full line of Pittsburgh house, industrial and automobile paints will be produced at Torrance. Model laboratory facilities will be installed and product development and control programs accelerated.

A lacquer producing plant will be moved intact from the firm's Los Angeles plant. Also planned is installation of a gas-fired resin manufacturing unit. Sufficient resin production is anticipated for both the Torrance and Portland paint plants operated by the firm.

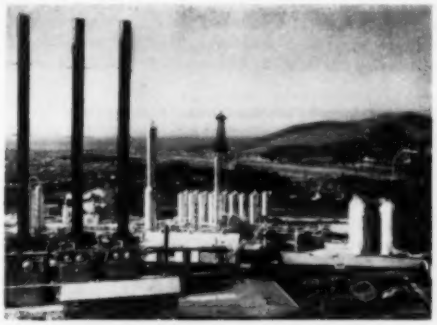
IBC Will Supply Know-How

Inventors in the San Francisco Bay area have a new "angel" to help market any salable gadgets and processes they may devise—an angel equipped for guardian duty.

The new agency is Inventors Business Consultants, Inc., a corporation set up by eight top business men as a spare time project. With three engineers, two lawyers, an accountant, an economic research expert and a publicist, the group will study an invention, determine its practicability and marketability, figure cost of production, seek out manufacturers and advise the inventor on the necessary legal precautions.

William H. Reese, Berkeley, an industrial salesman with a civil engineering degree, is founder and president of the organization. Working with Reese are E. Arthur Fowler, public accountant, vice president and treasurer; Herman Cook, partner in an Oakland law firm, secretary; Wilbur Barnes, chief chemical engineer of Cutter Laboratories; Philip Robertson, mechanical engineer; Paul Warrington, electronics engineer; Dr. Leonard Doyle, economist and consultant to the Henry J. Kaiser enterprises; Henry Gifford Hardy, patent attorney, and Llew Jones, executive with Foote, Cone & Belding.

According to Reese, the service costs inventors nothing unless inventions are actually sold, and the inventor retains the right to accept or reject all offers. IBC will collect 20 percent on all contracts made for the production of inventions. The group will look only at patented inventions.



Shell Modernizes Ventura

Shell Oil Co. has completed a major modernization program at its Ventura, Calif., natural gasoline absorption plant. One of the units installed in the plant is a large fractionating column. This 100-ft. column presented a major engineering task to transport it from the fabricator to its present location. It is the first such unit installed in a natural gasoline plant on the Pacific Coast, and makes possible the recovery of a high percentage of the potential propane without costly operations at sub-zero temperatures and expensive dehydration facilities.

The plant processes between 60 and 65 million cubic feet per day of natural "wet" gas from the Ventura oil field. It extracts and saves approximately 140,000 gal. per day of liquid hydrocarbons; the total gallonage depends upon seasonal demands for propane. For the past 20 years the plant has produced an average of about 100,000 gal. per day of liquid hydrocarbons.

To meet the rapidly increasing demand for propane as an all-purpose domestic fuel, Shell installed facilities in 1947 to make this product available to the market. With the continued increase in propane demand, major additions were installed during 1948 which were designed to extract and save up to 85 percent of the potential propane in the gas. At the rate gas was processed during the last winter period, the plant was able to produce 75,000 gal. of propane per day.

California Limits Pest Killers

As a result of the lush growth and occasional injurious applications of agricultural pesticides, the state of California is on the verge of issuing regulations governing the use of weed killers. This action follows (1) passage of a bill last spring giving the division of agriculture authority to govern the use of "injurious" herbicides, (2) hearings held by the division in September and October on regulations proposed by that state agency. Principal chemicals to be affected are 2,4-D and related compounds.

Charges by grape and cotton growers that applications of such herbicides to combat weeds in grain fields have injured or threatened to injure broad leaf plants led to a legislative study and passage of the new legislation.

The October hearing in Sacramento was, like the first, productive of no general agreement on the regulations proposed. Grain growers and spokesmen for the Bureau of Reclamation warned against severe limits on

the use of weed killers, while grape and cotton men insisted on close regulations. Manufacturers and distributors of herbicides were present primarily as onlookers.

State controls are on the way to cover a field much broader than weed killers. The legislature this year directed the state division of agriculture to issue wide regulations governing the entire field of agricultural pesticides and the thriving business of applying such materials.

Desert Chemist

In establishing the New Mexicraft Co. at Albuquerque, N. M., to manufacture perfumes from desert flowers and trees, Howard K. Foncanon has turned a hobby into a business. His "Perfumes of the Desert" are finding national retail outlets and building up a local demand in the gift classification.

Foncanon is his own chemist and is keeping the business a family concern. He has been shipping his pomade to an eastern chemist for processing into natural oils, but will soon have his own complete laboratory and handle the entire process from the harvesting of blossoms to the distillation and blending of finished perfumes.

Presenting the light, delicate fragrances of desert plant, Foncanon aims at every-day use by the consumer instead of special-occasion perfuming. He also has in mind the use of desert scents, such as that of pinon, in air conditioning systems for modern buildings and in paints, leather, linoleum and stationery.

Among Foncanon's desert fragrances are: ginger blossom, yucca (New Mexico state flower), devil's flower, desert jasmine, tamarack, desert bouquet, prickly pear cactus and desert mistletoe.

New Firm to Make Organics

A new company, Associated Chemicals, Inc., will erect a plant in the San Francisco bay region to manufacture a line of organic specialty chemicals. Plans are that production will begin next spring and that the marketing area will be the Pacific Coast and other western localities.

Organizers of the new firm are Manuel Gorin, chemical consultant in San Francisco, and Charles W. Harnden, previously a member of the market development group of Shell Development Co., Emeryville. Headquarters will be at 1144 Market St., San Francisco, where Gorin will continue for the time being in a consulting capacity. The company plans to become, in addition to its manufacturing work, a distributor for other producers of industrial chemicals.

Ready to Go

Production of silicon carbide is about to begin in the new $2 million plant of the Carborundum Co. at Vancouver, Wash. (PPI, Sept. 1949, p. 90).

Of the raw materials to be used in the operation—sawdust, coke, salt and sand—sawdust is obtained locally, and coke and salt are brought in from California. The sand comes from Spokane. Manufacture begins in the mix building where the raw materials are received for weighing and mixing in specially designed equipment. Included are automatic devices for weighing the materials and discharging them into the mixer.

At the end of 36 hr. in the furnaces at 4,000 deg. F. the reaction between silicon and carbon is complete. After power is shut off and before the product has entirely cooled the upper sections of the sides of the furnaces are removed, exposing the core of silicon carbide. The glistening mass is broken up, loaded into buckets and carried by overhead electric crane to a chute through which the chunks of abrasive enter a crusher as a preliminary step to further crushing and grading.

Salt Lake Gets Corrosion Group

National Association of Corrosion Engineers has a new chapter in Salt Lake City. Officers are: Harry R. Brough, Mountain Fuel Supply Co., chairman; William Littreal, Utah Oil Refining Co., first vice chairman; R. W. Vance, Utah Power & Light Co., second vice chairman; Bert Erickson, Mountain States Telephone & Telegraph Co., secretary-treasurer.

Papers on Western Chemical Needs

One of the features of the Pacific Chemical Exposition at San Francisco last month was the symposium on regional requirements for chemicals in the West. Papers covered "Consumption of Chemicals in Southern California," "Chemical Consumption in the Washington Area," "Chemical Requirements of Oregon and Southern Washington," "Chemical Requirements of the Intermountain Area," and "Northern California as a Market For Chemicals."

The set of five papers may be obtained for $1.50 through E. W. Eipper, Otomite Chemical Co., 38 Sansome St., San Francisco.

Westvaco Offers Phosphates

Westvaco Chemical Division of Food Machinery & Chemical Corp. plans to begin early next spring the manufacture of a line of phosphates at Westvaco's Newark, Calif., plant. The company has recently enlarged its capacity to make elemental phosphorus at Pocatello, Idaho, by the addition of a second electric furnace (*PPI*, June 1949, p. 60).

The planned list of phosphates to be produced at Newark includes sodium acid pyrophosphate, phosphoric

acid (75 percent), sodium tripolyphosphate, and tetrasodium pyrophosphate (anhydrous and crystals).

At present the Newark plant has facilities for manufacturing bromine, a line of magnesium compounds, calcium chloride and calcium sulphate.

Salt Lake to Boise Pipeline Progressing

The 8-in. Salt Lake City to Boise pipeline being constructed for Salt Lake Pipeline Co. and its allied Salt Lake Refining Co., is progressing so well, "it should be completed by the first of the year," states C. E. Finney president of the two companies.

The 320-mi. line, costing approximately $6,000,000, will carry an initial flow of 15,000 bbl. of gasoline, diesel and heating oil daily. Plans are reported ready for a 1950 extension of the line to Pasco, Wash.

Standard Oil Co. of California, the parent company, is expected to add or install bulk plants at Boise, Burley and Twin Falls, Idaho, and Ogden, Utah, as the line comes into service.

St. Helens Lifting Face

St. Helens Pulp & Paper Co. is nearing the end of a $1 million face lifting operation at St. Helens, Ore., to improve quality of products and reduce costs. Installation of equipment in the 20-yr.-old mill should be completed early next year at this large pulp and paper plant, which manufactures many types of paper specialties.

The new equipment includes a Beloit slicer of latest design, eight Weber bag making machines, a Whirley crane for handling pulp wood and four digesters to replace earlier models. The stainless steel lined digesters are the first type to be installed in a paper mill, and are being used instead of conventional carbon steel vessels in order to minimize corrosion. The bag making machines have a capacity of 200,000 six-lb. bags per 8 hr.

Cat Cracker on the Way

Excavations are being completed for installation of a Houdriflow Catalytic cracking unit at the Salt Lake Refining Co. plant just north of Salt Lake City. Company president C. E. Finney, Jr., states installation of the unit will get under way in early 1950 as part of the organization's previously reported $10,000,000 expansion program. Contractor for the design and installation at an undisclosed figure is the Bechtel Corp., San Francisco.

The unit is expected to increase efficiency of refinery operations and add to plant output of high octane gasoline. The new cat cracker has a rated capacity of 10,000 bbl. per day.

Current plant expansion includes installation of 15 new oil storage tanks and warehouse facilities to house refinery supplies and equipment.

Fire Damages Barium Products

At Modesto, Calif., not far from San Francisco, Barium Products, Ltd., is completing the reconstruction of portions of its plant recently destroyed by a fire unofficially estimated at $10,000. The company makes industrial barium derivatives, sodium sulphide and hydrogen peroxide.

Revere Rides Westward

Revere Copper and Brass, Inc., has opened at Los Angeles the first privately built mill on the West Coast for the fabrication of copper and brass. "We built our plant in Los Angeles because we felt the Pacific Coast market was a growing one and that by having the mill on the Coast we could better serve this market as well as the Far Eastern export market."

A few months before the Los Angeles project was opened, the company started operating in Riverside, Calif., a plant for making copper-clad stainless steel cooking vessels.

The marketing area to be covered by the plant is the Pacific Coast, plus parts of Arizona, Idaho, Nevada, Oregon, Utah, Washington and Montana.

Principal plant officials are Wallace H. Hitchcock, division manager; Charles J. Paumier, works manager; and Conrad Fick, treasurer.

Idaho and the AEC

The Atomic Energy Commisison is negotiating with the Chemical Plants division of the Blaw-Knox Construction Co., Pittsburgh, Pa., for a contract covering architect-engineer services for the engineering design of a materials testing reactor at Idaho Falls, Idaho.

Architect-engineer work to be performed will include the engineering design of the reactor and preparation of detailed specifications and cost estimates.

The new reactor's prime purpose will be to test various reactor construction materials under intense neutron bombardment. Intensity will far exceed any ever experienced before, even in the large production reactors at the Hanford plutonium works, Richland, Wash.

"The materials testing reactor," Lawrence R. Hafstad, Director of AEC's Division of Reactor Development, has said, "will provide the commission with a powerful new tool for the furtherance of the whole reactor development

program. Principally, it will be a means for testing fuel and structural materials under the severe conditions of temperature and radiation which will be encountered in the power reactors of the future. The reactor will therefore play a vital part in the development of atomic plants for production of power and atomic engines for propulsion of ships and possibly aircraft."

New Twist in the Twine Trade

Brain children in the form of waste utilization are cropping up with increasing rapidity. Latest is a new industry at Vancouver, Wash., which uses waste paper from Pacific Northwest paper mills to make twine, cordage and large size paper bags.

The paper products division of Portco Corp. has purchased the business of Perfection Twine Co., moved into the wartime maintenance building known as Hudson house, and installed new machinery.

A weird machine, developed by Portco, spins waste paper into cable-sized cord for use in upholstery. The machine, having the appearance of an octopus, twists rolls of paper tissue into one thick strand, called seaming cord.

Twine and cord for gardens, fleece binding, weaving and many other uses are produced from the waste. The process involves splitting mill trim rolls into strips, which are set on machines where the paper is twisted into cord. The number of rolls required to make one strand of cord depends upon the flexibility and strength desired. It is then waxed and lubricated to insure permanent flexibility.

Paper bags of giant size are another product of the company. Some are large enough to cover automobiles. One machine makes mattress covers automatically.

Plant capacity is 10,000 lb. of twine, 20,000 lb. of paper bags per day. Mill trim and bag paper is purchased from Crown-Willamette Corp., and the St. Helens Pulp & Paper Co.

A research department has been set up under the direction of Victor Rick, research engineer. Howard M. Wall is president of the company, with G. Ralph Meyer vice president and general manager.

Pacific Carbide Buys a Quarry

Pacific Carbide and Alloys Co., Portland, has bought the government-owned black marble limestone quarry near Enterprise, Ore. In addition to the limestone, the sale includes three kilns and other equipment. It is understood that present plans for use of the property call for the production of an amount of limestone sufficient to feed only the two Ellerman lime kilns that are part of the company's calcium carbide plant at Portland.

Longview Fibre Builds Own Power Facilities

A new $3,000,000 high pressure steam and electric plant has been placed in partial service by the Longview Fibre Co., Longview, Wash., according to R. S. Wertheimer, vice president and resident manager. Replacing three old direct fired boilers and three old recovery units, the new plant provides for future growth and permits the company to be independent of outside sources of electricity and steam if necessary.

The plant has three boilers designed for 900-psi. pressure, unusually high for industrial plants and approaching that used in modern utility plants, and a temperature of 750 deg. F., with a total capacity of 560,000 lb. of steam an hour. One boiler operates on waste liquors from pulp cooking and recovers both heat and useful chemicals, as well as minimizing stream pollution. The two direct-fired boilers are equipped to burn oil and one can burn hogged fuel.

Two turbo-generators, with a total capacity of 16,000 kw., take the high-pressure steam and deliver it at a lower pressure for mill usage.

Three men are the total plant requirements in manpower—one to operate a bulldozer pushing hogged fuel to the conveyor, another feeding hogged fuel onto the conveyor that fires one of the boilers and a third to watch the control panel and the feeding of fuel to the fire boxes.

Storage is provided for 20,000 units of hogged fuel, brought to the plant by truck. Two sides of the pile are retained by a bulkhead of timber and pile construction 24 ft. high.

Oil is brought to the mill in tank cars from an 80,000-bbl. company-owned storage tank at the Port of Longview and kept in a 10,700-bbl. service tank near the direct-fired boilers.

Height of the stack has been kept to 100 ft. by installation of a blower system which forces fumes up the stack.

The new plant was designed for the pulp and paper company by their own engineering division, headed by R. P. Wollenberg and V. M. Sutherling, with R. C. Powell of San Francisco as consultant. Principal contractors were the R. T. Earley Co. of Tacoma, Wash., and C. C. Moore & Co. and R. L. Johnson Corp. of San Francisco.

Los Angeles to Train Paint Men

To develop technicians and salesmen trained in the various phases of protective coatings manufacture, Los Angeles City College is opening in September a two-year course in the subject. As one of the major paint centers of the country, the city needs men of the type the course is designed to turn out.

The course, sponsored by the Los Angeles Paint, Varnish & Lacquer Association with support of the Paint Production Club, leads to the degree of associate in arts. The curriculum brings to the Los Angeles area a type of training in paint technology akin to that which has been available for several years in the City College of San Francisco.

The curriculum at Los Angeles includes semesters in the technology of paints, varnishes and lacquers; chemistry; physical science and business administration. It is designed to train students in all branches of the industry—manufacturing, laboratory work, salesmanship and purchasing.

The local PVL Association, which has furnished an advisory committee, will aid in coordinating activities and getting visiting lecturers from private industry. J. C. Taylor, Los Angeles City College, is coordinator for the course.

NAMES IN THE WEST

R. K. Hood

Robert K. Hood has been appointed sales manager of the industrial division of De Laval Pacific Co., San Francisco. Previously a sales engineer for the northern California area of the company, Hood succeeds **D. M. Landis**, who has gone to the New York City office of De Laval Separator Co. as assistant manager of the industrial division.

Donald S. Herr, formerly director of Shell Chemical Co.'s technical service laboratory at Martinez, Calif., has been appointed director of Shell's new technical service laboratory at Union, N. J.

G. F. Wilkins

George F. Wilkins of Los Angeles, has been named general manager of the fertilizer division of Gates Bros., Inc., Wendell, Ida. He also becomes an active member of the board of directors of the corporation. For 19 years Wilkins was associated with the General Chemical Division of Allied Chemical & Dye Corp. For the last nine years he headed up General's West Coast service department. He attended William & Mary College and the University of West Virginia.

F. S. Mulock, Salt Lake City, vice president and general manager of U. S. Smelting, Refining and Mining Co.'s western operations, has been promoted to president, replacing Michael H. Kurvla. **W. C. Page**, assistant general manager of the company's western operation replaces Mulock as general manager.

R. A. Butler

Robley A. Butler has been appointed technical control supervisor at the Ocean Falls division of Pacific Mills Ltd., Vancouver, B. C. Mr. Butler graduated from Oregon State College in 1939 with a B.S. degree in chemistry. He was previously employed in a technical capacity with Crown Zellerbach Corp. for 10 years.

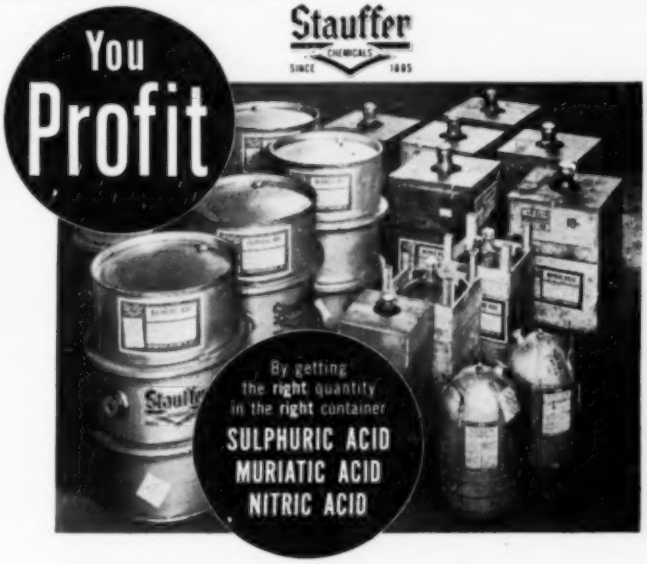
E. H. Vicary, manager of the central engineering division of Crown Zellerbach Corp., Seattle, has retired after 30 years' active service with the firm. He will be succeeded by his long-time assistant **W. J. Lowndes**, with the title of chief engineer of the central engineering division; headquarters, Seattle. Mr. Lowndes has been with the company since 1929. **R. P. Hutchinson**, who has been with Crown since 1934, will be assistant chief engineer.

William F. Giauque, professor of chemistry on the Berkeley campus of the University of California, has been awarded the 1949 Nobel Prize in chemistry by the Swedish Academy of Sciences. Dr. Giauque was singled out for the prize for his research on the nature of matter at very low temperatures.

W. J. Armstrong

W. J. Armstrong has been transferred to the northwest to handle sales and service for Byron Jackson Co.'s Pump Division. He will supervise paper mill, mine power station, industrial, and agricultural installations throughout Washington, western Idaho, British Columbia, and Alaska. His headquarters are in Seattle.

H. C. Mathey has been elected president of Stuart Oxygen Co., to succeed **W. A.**



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Brown, Jr., who remains as a director of the company. Mathey continues as general manager, with headquarters in Los Angeles, of the Pacific division of Liquid Carbonic Corp., of which Stuart is a wholly-owned subsidiary.

Reese H. Taylor has been named president of Los Nietos Co., a wholly-owned subsidiary of Union Oil Co. Other newly elected officers are: **W. L. Stewart, Jr.**, executive vice president; **A. C. Rubel**, vice president; **A. C. Stewart**, vice president; **H. W. Sanders**, vice president and treasurer; **L. A. Gibbons** vice president and general counsel.

Robert L. Chass was recently promoted to assistant director of the Los Angeles County Air Pollution Control District.

Fred D. Fleming, West Coast manager for Mallinckrodt Chemical Works, has retired after 28 years with the company. Fleming has been active in the development of the chemical industry on this coast, having concentrated his efforts in southern California for the past few years.

W. E. Major has sold the properties of W. E. Major Industries at Los Nietos, Calif., and has moved to San Francisco following a working agreement between Major Industries and Silver & Co., exporters-importers. Plans are to import certain chemicals, including insecticides and fertilizer materials, from Oriental countries and to export a line of commodities that will include salt and cottonseed oil.

Robert L. Loftness has joined the atomic energy research division of North American Aviation, Downey, Calif., as research engineer. He recently received his doctor of science degree at the Swiss Federal Institute of Technology, Zurich. Prior to that he attended the University of Washington at Seattle.

George L. Tyler has become manager of Du Pont's West Coast District Petroleum Chemicals Division at Los Angeles, replacing **David H. Conklin**, who has been promoted to assistant sales manager with headquarters in Wilmington, Del.

Kenneth E. Kingman has been named manager of manufacturing for Union Oil Co., and **Elmer B. Palmer** has been appointed to fill Kingman's former position as manager of Union's refinery at Los Angeles.

George C. Montgomery has been appointed to the newly created position of assistant administrative superintendent at Shell Oil Co.'s Wilmington-Dominguez refinery. **George A. Lorenz** has assumed Montgomery's former position of assistant operations superintendent.

FIRMS IN THE WEST

Permanente Metals Corp. has changed its name to **Kaiser Aluminum & Chemicals Corp.** The new name is regarded as a better indication of the scope of activities of the company. In the West the company is producing primary aluminum or aluminum products in Washington and at Permanente, Calif.; refractories and magnesium chemicals at Moss Landing, Calif.; dolomite at Natividad, Calif.; and soda ash at Owens Lake, Calif. Permanente's sales subsidiary, Permanente Products Co., has become Kaiser Aluminum & Chemical Sales Co.

Pacific Pumps, Inc., 5715 Bickett St., Huntington Park, Calif., purchased a 52,000 sq. ft. building adjacent to their present plant. The company manufactures centrifugal pumps for industrial and agricultural use and deep well oil pumps.

Zenith Plastics Co., 1548 West 135th St., Gardena, Calif., are adding an additional 5,600 sq. ft. to their present facilities for the manufacture of parts for the aircraft industry.

Reaction Products Co. is a new firm organized to manufacture copper sulphate and other copper salts at Richmond, Calif., for markets in northern California and trans-Pacific areas. Synthetic organic chemicals may be produced later. Head of the new firm is Conrad J. Gaiser, formerly chief chemist for Dorward & Sons, processors of vegetable oils at Richmond.

Nassau Chemicals, Inc., San Francisco, has become Pacific Coast distributors for the complete line of pesticides produced by John R. Powell & Co., New York. Nassau will distribute Powell's insecticides, weed killers and rodenticides in California, Oregon, Washington, New Mexico and British Columbia. Nassau also represents Wilmot & Cassidy of Brooklyn and the R. B. Chemical Co. of Cambridge, Mass.

Lefler Wynoont Supply Co., Casper, Wyo., has been appointed to represent De Laval Steam Turbine Co., of Trenton, N. J., in the Wyoming-Montana area. The company will handle a full line of De Laval pumps, turbines, blowers and gears.

Balfour Guthrie & Co., Ltd., distributors of industrial products on the Pacific Coast, has been named distributor for Borgana, a new boiler treatment for the prevention of scale and corrosion. Borgana will be distributed in all western states, Alaska, British Columbia and Hawaii through Balfour Guthrie branch offices in Portland, Seattle, Tacoma, Spokane, Los Angeles and San Francisco.

PROCESS PLANT BRIEFS

Soapstone—Pacific Minerals Co. has improved facilities at its Shrub Junction soapstone mine 8 mi. southwest of Shingle Springs, Calif., and is preparing to increase production. The material is used in the manufacture of cosmetics, paints and various commercial products.

Caustic & Chlorine—Columbia Cellulose Co., building a new pulp mill at Port Edward, B. C., has awarded a contract for barge transportation of 15,000 tons of liquid caustic and chlorine chemicals annually from the Hooker Electrochemical Co. plant at Tacoma, Wash. The chemicals will be used in the manufacture of pulp at the new British Columbia plant.

Sodium Hypochlorite—Purex Corp., Ltd., is building at Tacoma a plant to manufacture sodium hypochlorite bleaches and disinfectants from chlorine and caustic soda, and expects to be in production by January for markets in Washington, Oregon, Montana and Idaho. Over-all supervisor will be Earl Davis, general production manager at the Purex plant in South Gate, Calif., which manufactures bleaches and cleansers.

Glue—Consolidated Chemical Industries, Inc., has installed a new type of continuous glue drying installation at Bayshore, Calif., where the company manufactures animal glues and bone products. The automatic equipment is designed to produce filtered glue of constant quality.

Detergents—The Diversey Corp. of Chicago, manufacturers of industrial detergents and cleaners, has completed arrangements to install a branch manufacturing plant at South Gate, Calif. Plant will consist of 21,000 sq. ft. of building with spur trackage and approximately an acre additional land.

Smog Control — Bethlehem Pacific Coast Steel Corp. will spend $400,000 to control smog from the three open-hearth furnaces at its plant at Vernon, Calif. Electrical precipitators will be installed.

Rubber Products — Diamond Rubber Mfg. Co., Akron, Ohio, are shopping for a factory site in Downey, Calif. Firm would employ about 400 persons.

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DECEMBER
1949

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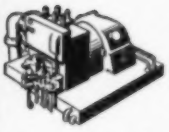
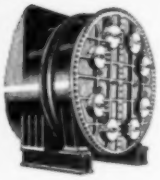
Steam Turbines



Allis-Chalmers steam turbines of the type shown in this installation are built to meet exacting standards of dependability, efficiency and accessibility. Built for any vacuum or exhaust pressure up to 400 lbs. Steam turbines of Allis-Chalmers design are available in all practical sizes . and are engineered to greatly reduce problems of operation and maintenance.

Surface Condensers

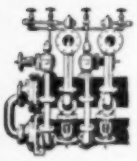


Every steam surface condenser built by Allis-Chalmers is tailor-made to specifications for the particular application. Through such flexibility of design the best size and shape of condenser is assured for each individual installation.

Condensers are designed to make every square foot of tube surface effective, to maintain lowest vacuum with minimum amount of heat rejection and expended energy

A-C engineering and manufacturing facilities for fabricating condensers in sizes from 100 to 100,000 sq ft are unexcelled anywhere. Write for **Bulletin 19B6784** showing condensers being built.

Steam Jet Air Ejectors



Allis-Chalmers surface condensers are furnished with steam jet air ejectors to remove air and other non-condensable vapors. Ejectors are precision-built units with no moving parts . . . and are designed to fit into small space. Usually ejectors are of the two-stage twin element type, but various other types and combinations are also available.

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Used for air or gas boosting, circulating, exhausting, agitating, aeration. Built by Allis-Chalmers for volumes and pressures to meet essentially all requirements . . . with performance characteristics favorable for parallel and series operation.

Multi-stage blowers employ backward-bladed impellers—high efficiencies without close clearances. Cannot build up dangerous pressures. Bulletin 16B6104.

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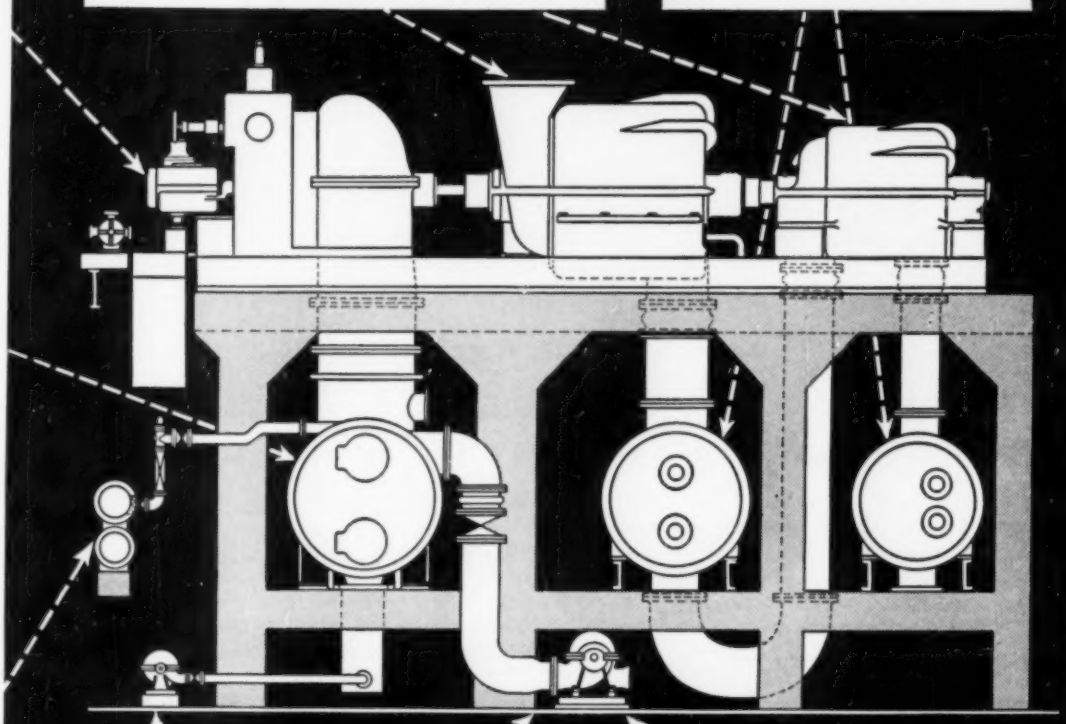
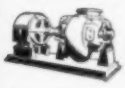
Surface type inter and after coolers are built by Allis-Chalmers in sizes to meet the requirements of the particular application. These units are of extremely heavy, rugged construction to withstand the severe operating conditions often encountered in this type of service.



Condensate Pumps



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Motors

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Motor Control

Proper control for all conditions of motor operation. Explosion-proof, water and dust-tight enclosures.

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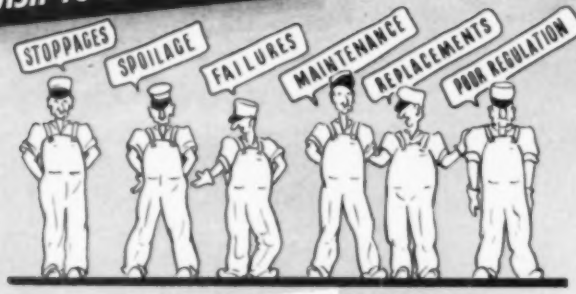

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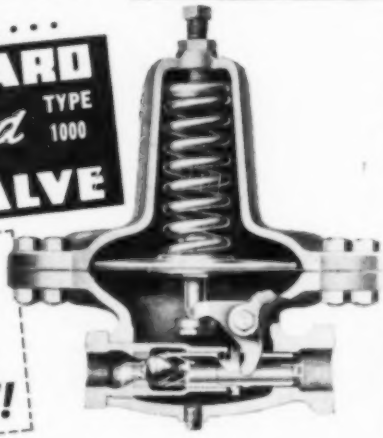

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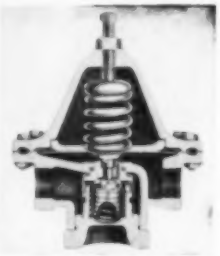
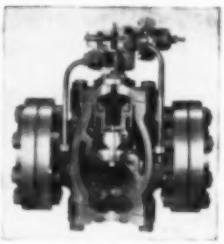


Bulletin 950—features the CASH STANDARD Type D Single Seat Pressure Reducing and Regulating Valves for use with most fluids. Shows simple inner working parts that save in maintenance. Diagram explains how valve works. Blueprint shows simplicity of installation.

Bulletin 956—features the CASH STANDARD Type 4030 Back Pressure Valve — designed to automatically maintain a constant pressure in the evaporator corresponding to a constant temperature desired. Shows an Ammonia and Freon Gas Capacity Chart based on ABSOLUTE pressures.



Bulletin 966—features the CASH STANDARD Self-Contained, Pilot Operated Type 10 Pressure Reducing and Regulating Valve for use with water or air; with any gas or oil that is non-corrosive; and with refrigerating fluids such as Ammonia and Freon. Many interesting particulars explained such as: how valve works, tight seating, large capacity, no waste, no water hammer or chatter.

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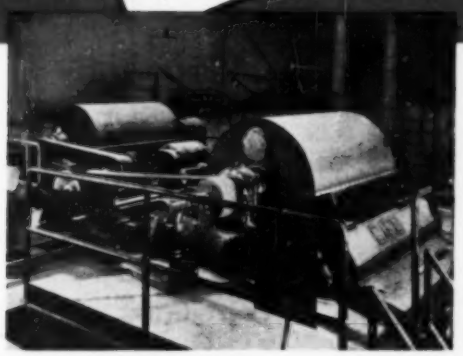
HEXAMINE
IRON ORE
IRON OXIDE
LANGBEINITE
LEAD ARSENATE
LEAD CHROMATE
LENS GRINDING ABRASIVES
LIME
LITHOPONE

M-R

MANGANESE ORE
NICKEL ORES
NICKEL SALTS
NITRATE SALTS
PACKING HOUSE WASTE
PECTIN
PHENOL
PHOSPHATE HIGH GRADE RESIDUE
PHOSPHATE ROCK
POTASSIUM CARBONATE
POTASSIUM CHLORIDE
POTASSIUM HYDROXIDE
POTASSIUM NITRATE
POTASSIUM SULPHATE
POTATO STARCH
RECLAIMED COAL
RUBBER RECLAIM

S-Z

SODIUM BICARBONATE
SODIUM BICHROMATE
SODIUM CARBONATE
SODIUM CHLORIDE
SODIUM FLUORIDE
SODIUM HYDROXIDE
SODIUM NITRATE
SODIUM STANNATE
SODIUM SULPHATE
SODIUM SULPHITE
SODIUM THIOSULPHATE
SOLVENT EXTRACTIONS
STARCH
SULFUR
SWEET POTATO STARCH
SYNTHETIC RESINS
SYNTHETIC RUBBER
TALLOW
TARTARIC ACID
TIN ORE
TITANIUM DIOXIDE
TRI-SODIUM PHOSPHATE
TUNGSTEN SALTS
ULTRAMARINE PIGMENT
VINYL RESINS
WHITE LEAD
ZINC CHROMATE
ZINC OXIDE
ZINC SULPHIDE



If you do, and you're not already using the Bird Centrifugal Filter, ask us to tell you what the Bird is doing to produce better products at lower cost per ton.

Plant after plant has found that it pays to replace other types of filters with BIRDS.

Now is a good time to look into it.

BIRD MACHINE COMPANY
SOUTH WALPOLE • MASSACHUSETTS

On every drum for every product Penn-Drake specifies:

EQUIPPED WITH TRI-SURE CLOSURES

MORE than 1,000 Penn-Drake products are shipped all over the world. And they are shipped in perfect security from seepage, leakage and tampering—because every Penn-Drake drum is protected by Tri-Sure Closures*

Years ago, the Pennsylvania Refining Company determined to give its products—and the reputation behind them—the finest protection obtainable. So in 1932, when the Tri-Sure Closure was first produced, the makers of Penn-Drake standardized on Tri-Sure protection—for every drum of every product—and they have been using Tri-Sure Closures ever since.

Leaders in the petroleum industry like the Pennsylvania Refining Company have *proved*—with years of experience—that there is no protection like Tri-Sure protection for fine liquid products. And the reason is that Tri-Sure Closures have a *flange* that is integral with the drumstock—as strong as the drum itself; a *plug* which is screwed securely into the *flange;* and a leak-proof *seal*—made of 195 lb. plate—which cannot be removed unless it is deliberately destroyed.

When you order drums, order *safe deliveries*—by specifying "Tri-Sure Closures", the surest safeguard for *your* product and your prestige.

Tri-Sure
CLOSURES

*The "Tri-Sure" Trademark is a mark of reliability backed by 27 years serving industry. It tells your customers that genuine Tri-Sure flanges (inserted with genuine Tri-Sure dies), plugs and seals have been used.

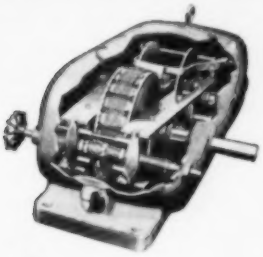
Play Safe by Specifying Tri-Sure Closures on Drum Orders

A FEW OF THE MORE THAN 1000 PENN-DRAKE PRODUCTS

Premium Penn-Drake
100% Pure Pennsylvania Motor Oils
Pennsylvania Bright Stocks and Neutrals
Penn-Drake Lubricants and Greases
Industrial Oils (Soluble and Quenching)
Colonel Drake Heavy Duty Oil
Colonel Drake Diesel Oils
Solvents
Insecticide Bases
Hydraulic Oils
Penn-Drake Gumout
Penn-Drake Snow Plow Wax
Drakeol U.S.P. White Mineral Oils
Petrolatums
Petrosuls (Petroleum Sulphonates)
Petrobases
Penn-Drake Anti-Freeze

AMERICAN FLANGE & MANUFACTURING CO. INC., 30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.
TRI-SURE PRODUCTS LIMITED, ST. CATHARINES, ONTARIO, CANADA

GREATER FLEXIBILITY... HIGHER PRODUCTION

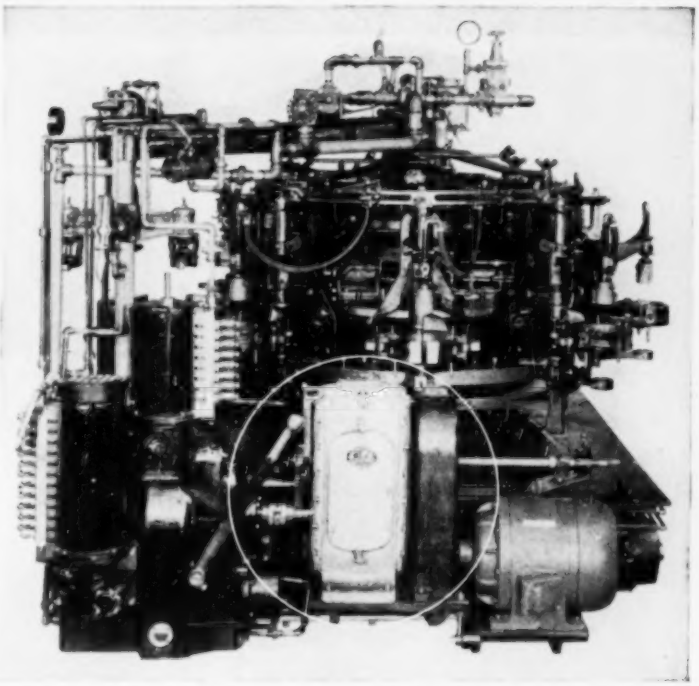


with

LINK-BELT P.I.V. Variable Speed Drive

Advantages of the Link-Belt P.I.V. Variable Speed Drive over fixed-ratio gears are clearly seen in such applications as the glass container machines built by the Lynch Corporation. With P.I.V. Variable Speed Drive, the speed of the machine can be altered instantly, while running, so no time is lost.

A second advantage of the P.I.V. Drive is that it provides for infinite variation between input and output speeds, instead of a limited number of ratios or steps. In starting a run, or when changing molds, the value of these features is at once apparent.



Lynch Corporation's model 16-B machine, end view, showing Link-Belt P.I.V. Variable Speed Drive.

Modern Glass Container Machines Equipped with Positive, Infinitely Variable Speed Drives

The P.I.V. Variable Speed Drive is unique, in that it utilizes the positive engagement of chain and toothed and grooved wheels, eliminating all possibility of slip or creep. All metal, wholly enclosed, splash lubricated, the P.I.V. Drive is highly efficient, durable and trouble-free in operation, requiring practically no attention. It is easily adapted to existing drives, and can be had in vertical or horizontal types, motorized or plain and with or without extra reduction gears. Sizes up to 25 H.P. Book No. 1874-B gives complete description and application data. Send for copy, now!

LINK-BELT

Power Transmission Machinery

"THE COMPLETE LINE"

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Houston 3, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices in Principal Cities.

11,388

Life ...on the

QUALITY CONTROL of many of Cyanamid's products begins at the source of the raw material—in this case, bauxite, mined at Cyanamid's recently developed Berbice properties in British Guiana. Development of Berbice involved actual clearing of jungle tracts and building of all units necessary to operate the mine and house its 200-odd employees. This operation provides an important new source of bauxite for Cyanamid's Sulfate of Alumina, an important chemical in paper-making, waterworks and sewage treatment, leather tanning, dyeing, ink-making and soap manufacturing.

clearing the land for the Berbice mine

view of open-pit mine showing power shovel in operation

the processing plant (washer) located at Berbice

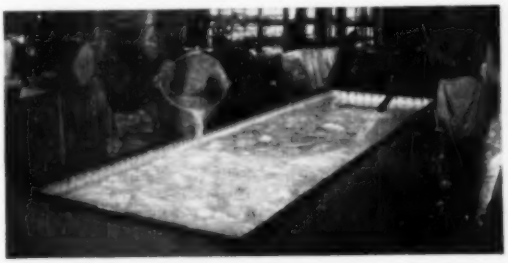
loading the barges with bauxite for transport downriver

view of administration building located at the mine

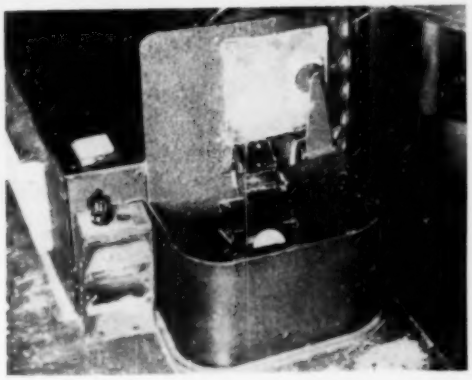
Chemical Newsfront

Courtesy Modern Packaging

WET-STRENGTH PAPER BANDS for celery retain their color and remain sealed throughout a cold-bath sterilizing process where they are drenched with thousands of gallons of ice-water. Cyanamid's PAREZ® RESIN 607 is the outstanding agent for imparting wet-strength to many types of paper for use in hundreds of different products.



NEW RUBBER PLASTICIZER, Cyanamid's PEPTON® 22 is unique in that it can be added to the latex at the plantation, as in the above scene in Malaya, thus saving an extra step in adding the PEPTON 22 plasticizer to the rubber on the mill. PEPTON 22 cuts breakdown time at least 50% and considerably improves the processing qualities of rubber. Full details are available on request.



THE "COMPENSATED OPAL." In color comparison made with a spectrophotometer, white opal glass is sometimes used as a secondary standard of whiteness in place of the more fragile and easily contaminated sample of magnesium oxide which is accepted as the "standard." However, the use of opal glass requires certain calculations to compensate for the differences in whiteness. In Cyanamid's laboratories, it was found that by combining opal glass with a compensating clear glass, a correction to the desired whiteness was achieved, thus eliminating the time consuming calculations. Photo above shows this "compensated" opal in place in a standard spectrophotometer.

American Cyanamid Company
Industrial Chemicals Division
30 Rockefeller Plaza, New York 20, N. Y.

Please send literature or further data on the products checked:

- ☐ PEPTON 22 Plasticizer
- ☐ PAREZ Resin 607 for wet-strength paper
- ☐ Catalog: "Products and Services of American Cyanamid Co. for Industry and Agriculture—Second Edition"

Name .....

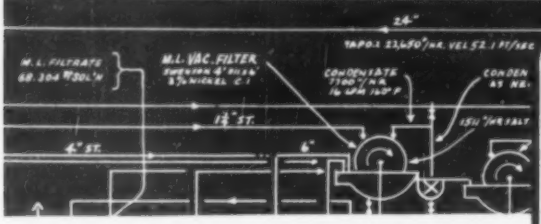
Company .....

Address .....

C.E. 12-49

AMERICAN *Cyanamid* COMPANY
30 ROCKEFELLER PLAZA · NEW YORK 20, N. Y.

HAVE YOU A
PROCESS PROBLEM
AS DIFFICULT
AS THESE?
Analysis of Requirements
Design and Layout
Manufacture of Equipment
Test Operation
Periodic Check-Ups
Hardly a division of the chemical industry has not been served by Swenson Engineers. Yet hardly a process cannot be further improved by application of Swenson Process Engineering.
Each succeeding development is but another step toward better products and lower costs.
Are you bothered with some phase of your processing? Would you like to have experienced Swenson Engineers assist you? We will welcome a chance to work on your toughest problem!
Only
SWENSON PROVIDES THIS FIVE-WAY SERVICE . . .
SWENSON
EVAPORATORS • FILTERS • CRYSTALLIZERS
SPRAY DRYERS



A few of the process problems *Swenson* Engineering has helped solve

Each of these processes had individual problems of corrosion, salting, scaling, temperature deterioration, foaming, entrainment, or other difficulties that required the experience and skill of engineering experts.

For each, **Swenson Process Engineering** worked out an answer that improved the product, reduced costs, or made operations more satisfactory and profitable.

Many other instances can be cited—but these representative cases indicate the extremely wide range of Swenson experience—experience that can be brought to bear on YOUR problems if you will let Swenson co-operate.

ALKALI

AMMONIUM THIOCYANATE

BEET SUGAR

COPPER ELECTROLYTE

DISODIUM AND TRISODIUM PHOSPHATE

DISTILLERS' SOLUBLES

GLUE

MAGNESIUM CHLORIDE

PAPER PULP

PECTIN

PHOSPHORIC ACID

PICKLE LIQUOR (from Steel Mills)

POTASH (from Sylvinite Ore)

SALT

SODIUM SULFATE

SOAP LYE GLYCERINE

SULFURIC ACID (from industrial wastes)

VISCOSE RAYON AND CELLOPHANE (recovery of chemicals)

ZINC SULFATE

SWENSON EVAPORATOR COMPANY

Division of Whiting Corporation

15669 Lathrop Avenue Harvey, Illinois

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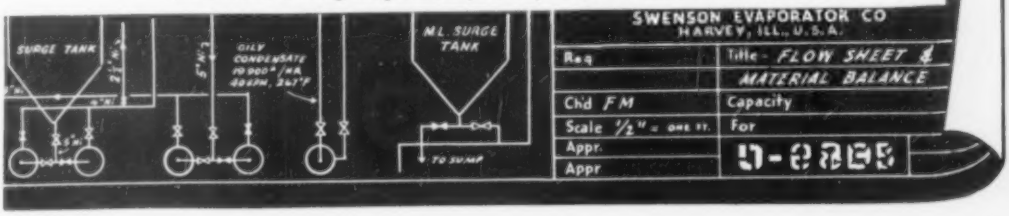

FOR YOUR INFORMATION

HERE'S A LIBRARY OF TECHNICAL INFORMATION ON CHEMICALS

If you are connected with a company that uses chemicals, an extensive library of technical literature is available to you from Monsanto. Many of Monsanto's staple products, as well as many that are brand new, have had literature written about them. On these pages is listed some of this literature. You may have printed material you want simply by filling in the coupon, circling the numbers that correspond to the bold-face number at the left of each listing.

If you have any problems involving chemistry or plastics on which you think Monsanto might be of help, write any Monsanto Sales Office or direct to Monsanto headquarters, St. Louis 4, Missouri. Your inquiry will be given prompt attention.

Valuable Reference Book on Chemicals and Plastics

1. General Catalog: *Monsanto Chemicals and Plastics* (28th Edition). Here's a valuable reference book for any person or company using a number of chemicals or plastics. The 28th Edition contains 176 pages (8½ x 11 inches) and describes more than 400 products. If you use chemicals or plastics in quantity, send for your free copy of the 28th Edition of "Monsanto Chemicals and Plastics."

Heavy Chemicals and Intermediates

Scores of Monsanto Products are classified as intermediates or heavy chemicals. Many of them are staples in industry and are not covered by special literature, but are included in the "28th Edition, Monsanto Chemicals and Plastics." Others have uses other than as intermediates and literature is listed under the classification in which the specialized use falls. For example: *ortho*-Dichlorobenzene is an intermediate for dyestuffs and also an insecticidal chemical. Literature is listed in the insecticidal group.

The following printed material is available on heavy chemicals and intermediates:

2. Booklet: *Chlorine (Monsanto).*

3. Folder: *Chemicals for Water Treatment.*

4. Folder: *Products for the Pulp and Paper Industry.*

Food Preservation

5. Booklet: *Benzoic Acid and the Benzoates.* This publication is packed with information that is extremely useful to anyone with a food or beverage preservation problem.

6. Folder: *Preserving with Sodium Benzoate.*

Sulfuric Acid Plants

7. Booklet: *Monsanto-Ross-Wilde Process.* If your business requires sulfuric acid in volume, this booklet is important reading. It tells you how you can save money by producing your own acid and how Monsanto will assist you with the latest, postwar designs for contact plants.

Aromas and Flavor Chemicals

8. Booklet: *Something About The Senses.* This publication gives an interesting history of the development and use of flavors and aromas, plus technical information.

9. Folder: *Coumarin.*

10. Folder: *Ethavan*® (Monsanto's Ethyl Vanillin).

11. Folder: *Methyl Salicylate* (Synthetic oil of wintergreen).

12. Folder: *Vanillin.*

13. Folder: *Saccharin.*

Detergents and Wetting Agents

Monsanto Detergents and Wetting Agents are widely used in the manufacture of textiles, in cleaning compounds and in industrial cleaning. The following literature is available:

14. Booklet: *Santomerse*® *No. 1.* This is a thorough treatise on Santomerse No. 1, the all-purpose detergent and wetting agent.

15. Tech. Bulletin: *Sepanox.*® (An amino compound to prevent rancidity and deterioration in soaps and vegetable oils.)

16. Tech. Bulletin: *SA-326 An Antioxidant For Soaps.*

17. Tech. Bulletin: *Santomerse D, S, No. 3 Paste.*

18. Tech. Bulletin: *Santomerse B.*

19. Tech. Bulletin: *Santomerse 30X.*

20. Reprint: *Builder With Synthetic Detergents.*

21. Reprint: *Evaluation of Surface-Active Agents.*

22. Folder: *Santomerse No. 1.*

23. Folder: *Chemistry In Cleaning.*

Phosphates

24. Booklet: *Phosphorus The Light Bearer.* The interesting story of phosphorus, from its discovery to its present-day production and use, is presented in non-technical terms in this booklet.

25. Tech. Bulletin: *Tetra Potassium Pyrophosphate.*

26. Tech. Bulletin: *Tetra Sodium Pyrophosphate.*

27. Tech. Bulletin: *Phosphoric Acid.*

28. Tech. Bulletin: *Fire Retardant B.*

29. Tech. Bulletin: *Fire Retardant A.*

30. Tech. Bulletin: *Santowax*® *R.*

31. Tech. Bulletin: *HB-40.*® (Clear, mobile, high-boiling hydrocarbon.)

32. Tech. Bulletin: *Mixed Isomeric Terphenyls.*

33. Tech. Bulletin: *Alkyl Acid Phosphates.*

34. Tech. Bulletin: *Alkyl Alkali Phosphates.*

35. Tech. Bulletin: *Isocyanates.*

36. Folder: *Sodium Acid Pyrophosphate.*

Miscellaneous Literature

37. Tech. Bulletin: *Santosite*® (*Sodium Sulfite Anhydrous, Technical*) *For Removing Oxygen From Boiler Feed Water.*

38. Folder: *Santosite the Milder Pulping Agent.*

39. Booklet: *Skydrol.*® (Skydrol is a flame-resistant hydraulic fluid for airplanes.)

News of Monsanto Chemicals for the Process Industries . . . December, 1949

The Aroclors

40. Tech. Bulletin: *The AROCLORS** (Chlorinated biphenyl and chlorinated polyphenyls). This gives you a broad picture of the AROCLORS . . . their properties and their applications.

41. Tech. Bulletin: *AROCLORS As Used In Pliolite S-5.*

42. Tech. Bulletin: *AROCLORS As Co-Polyvinylchloride.*

43. Tech. Bulletin: *AROCLORS Used to Extend or Substitute Carnauba Wax.*

44. Tech. Bulletin: *AROCLOR 1254—Co-plasticizer with DOP for Vinyl Organosols and Pastes.*

45. Tech. Bulletin: *AROCLOR—A Nonflammable Hydraulic Fluid.*

46. Tech. Bulletin: *AROCLOR 1254 —Lubricant and Plasticizer.*

47. Reprint: *AROCLOR 1248—Heat-Transfer Medium.*

Santobrite

Santobrite* (Sodium Pentachlorophenate, Technical) is used to control slime and algae in the pulp and paper industry, in cooling towers and elsewhere. Santobrite also controls sap stain in lumber and preserves such products as adhesives and rubber latex.

48. Tech. Bulletin: *Santobrite for the Preservation of Adhesives.*

49. Tech. Bulletin: *Santobrite for the Control of Slime and Algae.*

50. Booklet: *Sap Stain Control.*

Petroleum Additives

Monsanto's oil additives, developed to make good lubricants better, include those that make oils pour freely in cold weather, those which improve viscosity, those which keep motor parts clean and those that enable refiners to make one gear lubricant that serves in both conventional and hypoid gears. Details on these products can be found in the following literature:

51. Booklet: *Science and Oil.* This booklet tells how additives take up where nature left off in the production of superior lubricants.

52. Booklet: *Detergent Oil Additives.*

Wood Preservation and Termite Control

MONSANTO PENTAchlorophenol (Santophen* 20) gives positive protection against termites, wood-boring insects and decay caused by fungi.

53. Booklet: *Penta, Best Protection for Poles and Crossarms.*

54. Folder: *Building With Santophen 20 Preserved Wood.*

55. Folder: *Fence Posts — Make Them Last With Penta.*

56. Folder: *Santophen in Industrial Construction.*

57. Reprint: *Wood-Preserving Applications With Monsanto Penta.*

Chemicals to Control Mildew

58. Progress Report: *Milmer* 1—A Safe, Effective Industrial Preservative.*

59. Progress Report: *Guide to Formulating and Applying Milmer 1.*

60. Tech. Bulletin: *Milmer 1 — Physical, Chemical and Biological Properties.*

61. Tech. Paper: *Preservation of Cotton Fabrics With Copper 8-Quinolinolate.*

Insecticidal Chemicals

62. Booklet: *Santobane* (DDT),* telling where and how to use Santobane to destroy bothersome insects.

63. Tech. Bulletin: *Nifos*-T, Organic Phosphate Insecticide.*

64. Folder: *Nifos-T. Monsanto's New, Improved Insect-Killer.*

65. Tech. Bulletin: *Santochlor* for Control of Peach-Tree Borer.*

66. Tech. Bulletin: *Santochlor — Properties and Applications.*

67. Booklet: *Santochlor for Clothes Moth Control.*

68. Folder: *ortho-Dichlorobenzene.*

Herbicidal Chemicals

69. Progress Report: *2,4,5-T . . . A Herbicide for Brush and Woody Plants.*

70. Tech. Bulletin: *2,4-D for Weed Control.*

71. Booklet: *Killers in the Field.*

Disinfectant

72. Tech. Bulletin: *Santophen 1 for use in disinfectants.*

Pest Control

73. Folder: *Pest Control.*

74. Tech. Bulletin: *Compound 1080** (Most effective of all rodenticides.)

Plasticizers and Resins

75. Booklet: *Monsanto Plasticizers* . . . a thorough presentation of Monsanto's complete line of plasticizers.

76. Booklet: *Santicizer* 141.*

77. Folder: *Monsanto Santicizers.*

Rubber Chemicals

The Rubber Industry builds quality into its products by using Monsanto Plasticizers and with a group of Monsanto Chemicals developed especially for rubber. For information write: Rubber Service Department, 920 Brown Street, Akron 11, Ohio.

78. Booklet: *Monsanto Chemicals For The Rubber Industry.* *Reg. U. S. Pat. Off.

☆ ☆ ☆

MONSANTO CHEMICAL COMPANY, Desk M, 1702 South Second Street, St. Louis 4, Missouri. District Sales Offices: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle. In Canada, Monsanto (Canada) Ltd., Montreal.

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CHEMICALS — PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

Please send the following Monsanto literature:

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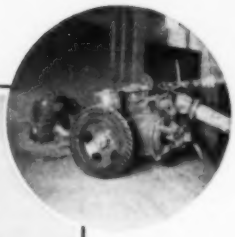
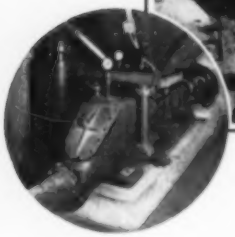




SPEEDY - - - ECONOMICAL UNLOADING AND CONVEYING FULLER-KINYON SYSTEMS

The quick and efficient method of unloading and conveying dry pulverized materials from box cars, hopper-bottom cars, ships, barges, storage bins and silos.

Fuller-Kinyon Pumps are built in three different types . . . stationary, portable, and the remote-control unloader . . . selection and application according to the service to be accomplished, at the lowest cost per ton of material handled. They're built in various sizes, for a wide range in capacities, from a few tons per hour to 300 tons per hour.

Your conveying operation need not demand large tonnages or capacities to warrant the installation of a Fuller-Kinyon System. One man can operate the system with a minimum of supervision. Plant layouts can be designed for maximum convenience and economy in handling and storing, in production and shipment of finished products. Easily applied to existing plants, without interrupting production, or interfering with structures or equipment.

Why not have a Fuller engineer look over your plant? He'll be glad to make a study of your conditions and recommend equipment best suited to your needs.

fuller COMPANY

CATASAUQUA, PA. CHICAGO - SAN FRANCISCO

A name to remember when you have conveying to do

FULLER COMPANY

FULLER-KINYON, FULLER-FLUXO AND THE AIRVEYOR CONVEYING SYSTEMS
ROTARY FEEDERS AND DISCHARGE GATES . . ROTARY AIR COMPRESSORS AND VACUUM PUMPS . . . AIR-QUENCHING INCLINED-GRATE COOLERS . . . DRY PULVERIZED-MATERIAL COOLER . . . AERATION UNITS . . . MATERIAL-LEVEL INDICATORS . . MOTION SAFETY SWITCH . . SLURRY VALVES . . . SAMPLERS

P-101

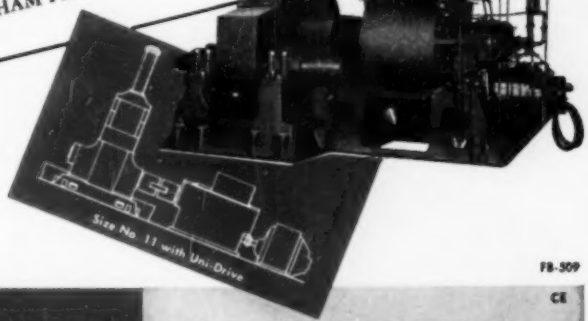
Size of Machine	Net Volume of Chamber Cu. Ins.	Approximate Capacity Stiff Paste Pounds per Batch Factor x Specific Gravity	Motor Horsepower Standard and Double Speed	Approximate Floor Space Length	Width
B	103	Sp. Gr. x 2.5	Four Speed 8½/12½ 17/25	8'0"	3'0"
00	263	Sp. Gr. x 4	15/30	10'0"	4'6"
1	1193	Sp. Gr. x 24	50/100	12'0"	5'10"
1-A	1193	Sp. Gr. x 24	50/100	14'8"	6'0"
3-A	4315	Sp. Gr. x 100	150/300	23'0"	10'0"
3-A Uni-Drive	4315	Sp. Gr. x 100	150/300	25'0"	10'6"
11	14940	Sp. Gr. x 300	300/600	34'0"	13'6"
11 Uni-Drive	14940	Sp. Gr. x 300	300/600	32'3"	11'0"

THERE'S A BANBURY SIZE TO SUIT YOUR NEEDS EXACTLY

Banbury mixers are made in eight standard sizes for processing plastics, from the size B for laboratory or small production work to the No. 11 with its net chamber capacity of 14,940 cubic inches. With such a range of machines to choose from, you can select the mixer that will provide the production you require.

Furthermore, Farrel-Birmingham engineers have developed other production units, such as extruders, warming and sheeting mills, and calenders, which are *matched in capacity* with the various sizes of Banburys. This means that a layout can be *engineered* that will eliminate the "choking" or "starving" of any machine in the line. Production can be *designed* to flow without costly interruptions and with manual aid and supervision reduced to a minimum. Isn't this worth investigating?

Before you purchase new processing equipment, call in a Farrel-Birmingham engineer. In the meantime, send for a copy of *NEW* bulletin, "FARREL-BIRMINGHAM PROCESSING MACHINERY."


Size No. 11

Size No. 11 with Uni-Drive

FB-509

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONNECTICUT

Plants: Ansonia and Derby, Conn.; Buffalo, New York
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FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN.

Please send me, without cost or obligation, a copy of your new bulletin No. 188 "FARREL-BIRMINGHAM PROCESSING MACHINERY."

Name..... Title.....

Company .....

Address .....

City..... State.....

YOUR FLOW METERING PROBLEM

May Already be Solved...

...by one of the SK Rotameters in our standard line.

That's why it would pay you to investigate—acquaint yourself with the numerous types and sizes we have to offer.

Many years of experience in solving hundreds of customer problems have helped us to design a group of Rotameters sufficiently diversified to meet most industrial requirements. However, should your problem differ from others so radically that one of our standard types won't solve it, you can count on our engineers to give you all the help possible in designing a new unit which will.

Bulletin 18-RA, shown at left, pictures and briefly describes the construction and principle applications of all standard SK Rotameters. It's yours for the asking.

SCHUTTE and KOERTING Company

Manufacturing Engineers

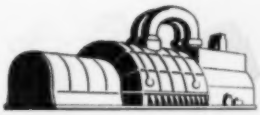
1190 THOMPSON STREET • PHILADELPHIA 22, PA.

JET APPARATUS • HEAT TRANSFER EQUIPMENT • STRAINERS • CONDENSERS AND VACUUM PUMPS • OIL BURNING EQUIPMENT • ROTAMETERS • FLOW INDICATORS • RADIAFIN TUBES • VALVES • SPRAY NOZZLES AND ATOMIZERS • GEAR PUMPS • DESUPERHEATERS

Plants from Maine to Texas have cut operating and maintenance costs with these Gulf Quality Products

GULF CUTTING OILS can help you get greater production, longer tool life, and better finishes.

GULF SUPER-QUENCH—dual-action quenching oil—achieves greater hardness in many types of steel.

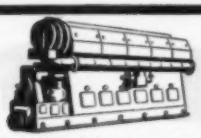


GULFCREST OIL—the world's finest turbine oil—lasts indefinitely.

GULFGEM OIL—Alchlor-processed—provides better lubrication for spindles.

GULF E. P. LUBRICANTS—for better protection of enclosed gears—ideal for tableways.

GULF ANTI-FRICTION GREASE—provides better lubrication for ball and roller bearings.

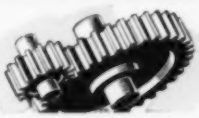


GULF PARVIS OIL—for industrial and marine Diesels—helps keep maintenance costs low.

GULF RUST PREVENTIVES—both oil and petrolatum types for every requirement.

GULF HARMONY OIL WCR—highly resistant to oxidation and gumming—ideal hydraulic oil.

GULF SANI-SOIL-SET allays dust on plant grounds—keeps it out of laundries and plants.



GULF LUBCOTE provides better lubrication for open gears, stays on, saves wear.

GULFLUBE MOTOROIL H. D.—quality paraffin base "Heavy Duty Type" oil with full detergency.

It will pay you to investigate their application in your plant... *Call in a Gulf Lubrication Engineer today!*

GULF OIL CORPORATION · GULF REFINING COMPANY
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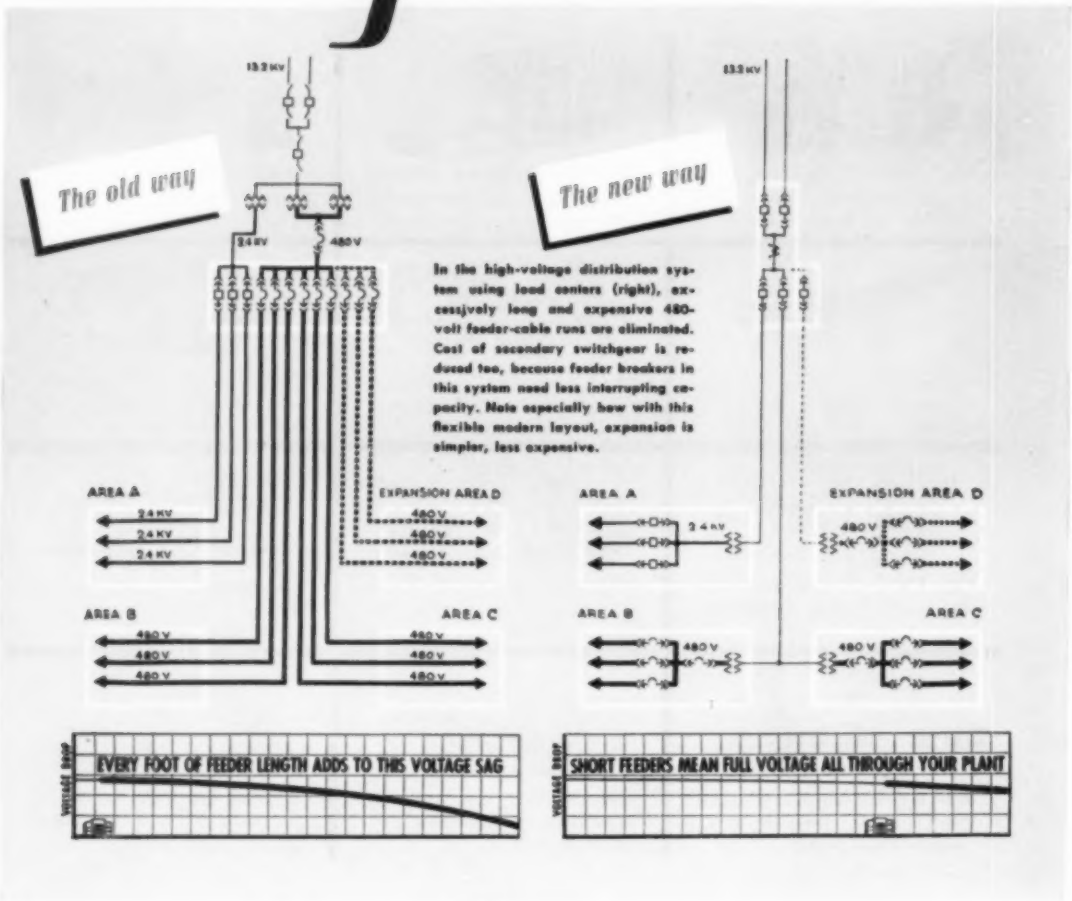
GULF INDUSTRIAL LUBRICATION — *helps make machines produce more at lower cost*

What's the trend in chemical plant electrification? } more high-



Here's what you need to modernize your power system! }

WHEN YOU COME TO GENERAL ELECTRIC you get far more than the finest in electrical equipment. A General Electric application engineer, familiar with chemical plant practices, is at your disposal. If desired, he stands ready to take over the job of co-ordinating all the needed components, engineering your power distribution into one modern, efficient system.

voltage distribution

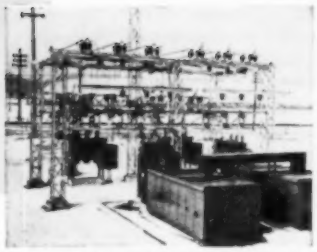
to reduce power losses, cut equipment costs

You see it in more and more chemical plants today. It's the trend to load-center power distribution. High-voltage power is distributed within the plant right to the heart of electrical load areas. There it's stepped down to utilization levels in load-center unit substations and carried to points of use by *short* low-voltage secondary feeders.

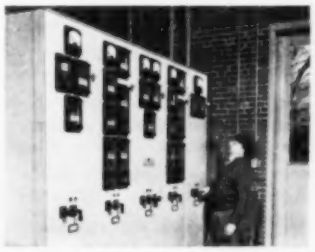
This modern method provides several advantages. By replacing long, low-voltage feeders with short ones, voltage fluctuation is kept within narrow limits, and voltage drop is lessened. This cuts power losses, permits plant equipment to run at full efficiency.

Economies in the cost of cable runs, as well as in the cost of transformers and secondary switchgear, go hand in hand with high-voltage distribution. Plant rearrangements or additions can be made at less cost because of the flexibility of this system. Lower maintenance costs and easier installation are added advantages.

THREE KINDS OF HELP . . . NO OBLIGATION! It's a simple matter for you to get the whole story on how modern chemical plant power distribution can affect your plant layout, operating continuity, costs. As a service to industry, General Electric offers a 3-point program comprising (1) A fact-filled manual, without sales talk, on plant power distribution; (2) A slidefilm with sound that shows in detail what load-center distribution is and what it does; (3) Illustrated booklets highlighting the main points of manual and film. Write today to have this helpful program made available to you and your staff—without charge or obligation. *Apparatus Dept., General Electric Company, Schenectady, 5, N. Y.*



These completely metal-enclosed G-E package substations are factory-built to fully coordinated designs. You save both engineering time and installation time.



In G-E metal-clad switchgear, convenient vertical-lift construction of magne-blast air circuit breakers makes it a quick, easy job to remove them for inspection or maintenance.

Load-center unit substations—compact, fully enclosed, and built from matched components—are complete, easy-to-specify units. Made in flexible combinations, they're easy to move and rearrange.

GENERAL ELECTRIC

. . . then specify ALCOA Alumina for refractories and refractory porcelains

The single-barrel, double and multiple-barrel porcelain tubes, illustrated above, are used as combustion tubes, pyrometer protection tubes and high temperature thermocouple insulators. The manufacturer can guarantee them for temperatures as high as 2900° F., because they are fortified with ALCOA Alumina.

The *higher* the ALCOA Alumina content in porcelains such as these, in refractory brick and other high-temperature ceramics, the *better* the performance. Why? Because ALCOA Alumina gives refractories and other ceramics these outstanding qualities:

- **High strength and better stability under load at high temperatures.**
- **Lower co-efficient of expansion.**
- **High resistance to both thermal and mechanical shock.**
- **Negligible porosity and shrinkage.**
- **Better resistance to spalling at high temperatures.**
- **Better resistance to corrosive slags and gases.**

These performance characteristics increase as the ALCOA Alumina content increases!

We do not make refractories or other kinds of ceramics, but we'll gladly tell you how the use of ALCOA Alumina will *better* the performance of the ceramic products you manufacture or use. Write to: ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 1778 Gulf Building, Pittsburgh 19, Pa.

The high-temperature refractory porcelains, illustrated above, are manufactured by McDanel Refractory Porcelain Co.

ALCOA

ALCOA CHEMICALS

ALUMINAS AND FLUORIDES

ACTIVATED ALUMINAS • CALCINED ALUMINAS • LOW SODA ALUMINAS • TABULAR ALUMINAS • HYDRATED ALUMINA
ALUMINUM FLUORIDE • SODIUM FLUORIDE • SODIUM ACID FLUORIDE • FLUOBORIC ACID • CRYOLITE

for the big job
...or the small

there's an SKF
pillow block for
every application

SKF Spherical Roller Bearing Pillow Blocks, in a wide range of standard sizes, are designed for bearing protection under various loads and speeds.

In industrial and marine equipment of all kinds, they keep SKF Bearings rolling smoothly, continuously and economically . . . seal the bearings against dust, scale and water . . . send maintenance costs 'way down.

To insure long trouble-free operation, specify SKF Bearings by ordering SKF Pillow Blocks to match. SKF Industries, Inc., Philadelphia 32, Pa.

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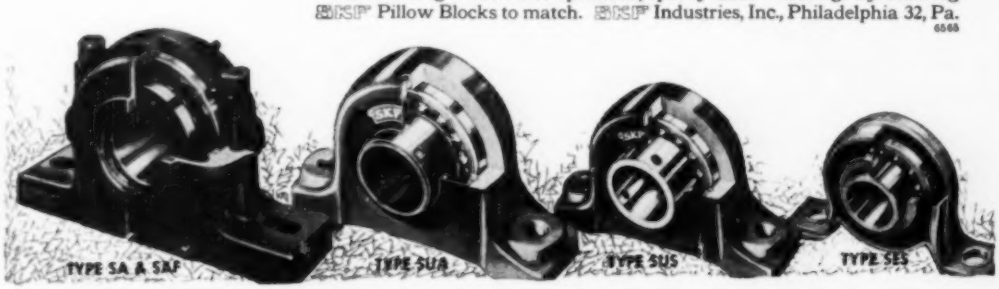
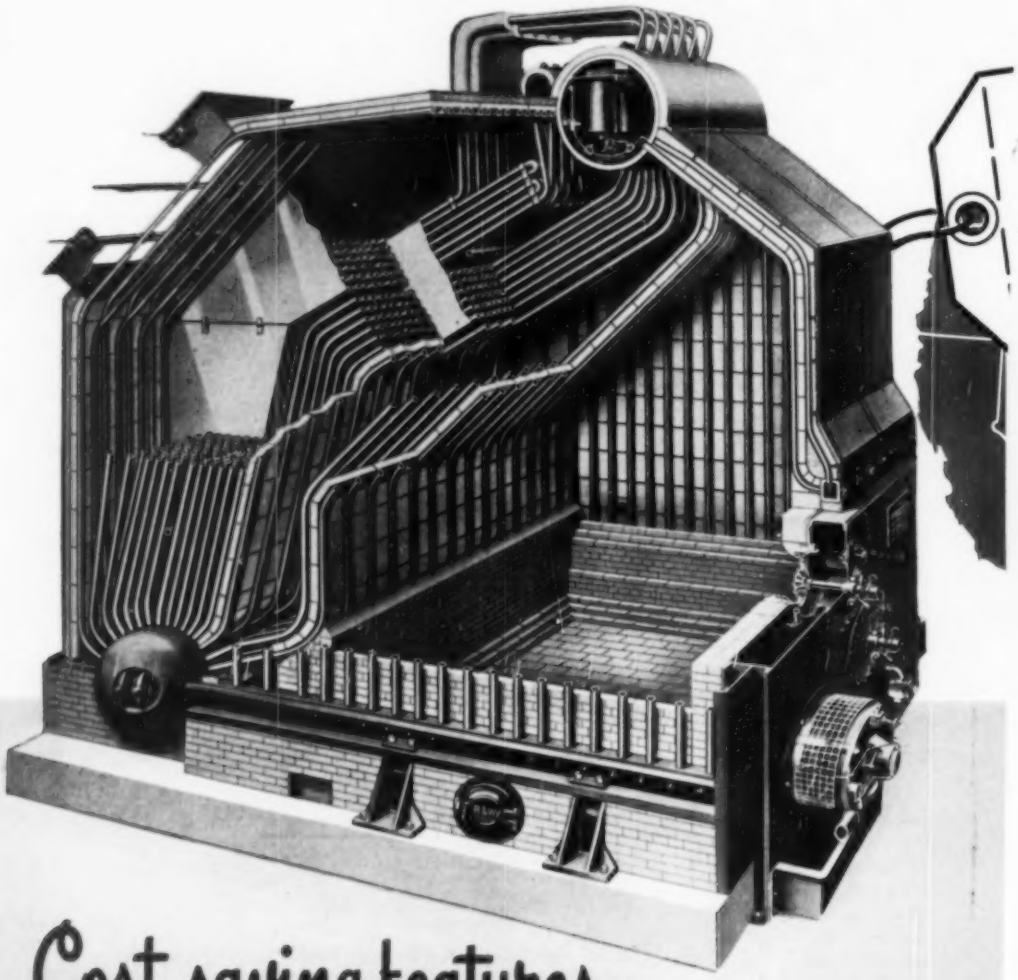


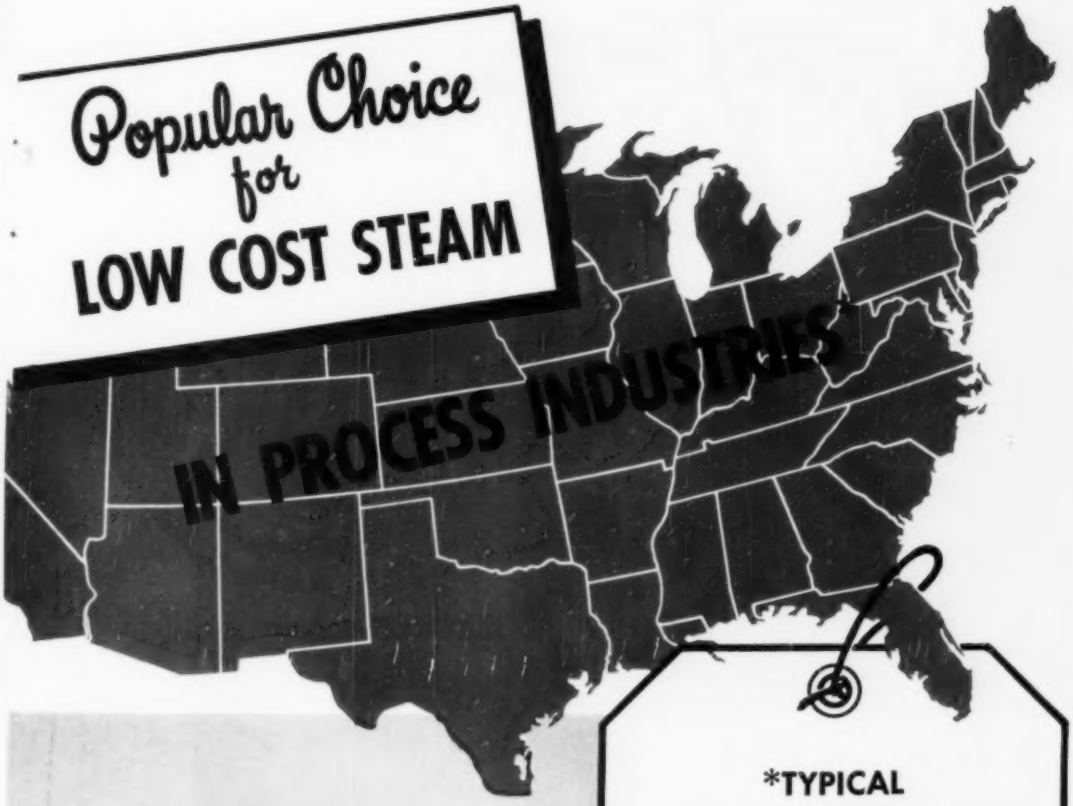


Cost saving features

OF B&W INTEGRAL-FURNACE BOILER, TYPE FF

- Moderate first cost
- Minimum floor space and headroom requirements
- High fuel economy
- Smokeless combustion
- Adaptable to all fuels and firing methods
- Economical fast steaming
- Water-cooled furnace
- Clean, dry steam at all ratings even with high boiler water concentrations
- Quick response to wide and heavy load swing demands
- Easy to inspect and clean
- High availability with least attention

Popular Choice for LOW COST STEAM IN PROCESS INDUSTRIES



It's the B&W Integral-Furnace Boiler, Type FF . . . the self-contained, compact unit that is piling up highly impressive records for economical and dependable steam generation in hundreds of widely diversified installations* all over the Nation. Operating and maintenance features listed on the opposite page indicate why this completely coordinated, standardized design has earned the confidence of industries, utilities, and other users requiring boiler capacities up to 60,000 lb. per hr. at pressures above 160 psi.

It will pay you, as it has so many others, to investigate the advantages of this outstanding B&W boiler. Begin by asking for Bulletin G-64.

BABCOCK & WILCOX

*TYPICAL PROCESS INDUSTRIES SERVED BY B & W INTEGRAL-FURNACE BOILERS TYPE FF

Abrasives	Leather
Baking	Lumber
Beverages	Meat Packing
Brewing	Mining
Building Materials	Non-Ferrous Metal
Candy	Oil Refining
Chemicals	Paint
Dairy	Paper
Distilling	Plastics
Drugs	Rubber
Food	Sugar
Fruit Packing	Textile
Gas Plants	Tobacco
Glass	Stores

G-4731

Built to Keep Instrument Up-Keep DOWN

1. *Vacuum Tubes* reduce maintenance
2. *Mercury Switches* reduce maintenance
3. *Enclosed Motor* reduces maintenance
4. *Enclosed Slide Wire* reduces maintenance

YES, *ElectroniK* POTENTIOMETERS ARE RUGGED!

Yet with all this, *ElectroniK* Potentiometers possess greater accuracy, sensitivity and speed of response. Try them and you'll see . . . they have been acclaimed for outstanding performance for eight years in all industries.

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BROWN INSTRUMENTS DIVISION
4478 Wayne Ave., Philadelphia 44, Pa.
Offices in 58 principal cities of the United States, Canada and throughout the world

ElectroniK Potentiometers . . . strip chart, circular scale and circular chart . . . are fully explained and described in Catalog 15-13. A copy will be sent to you upon request . . . write today!

Honeywell — *Advanced Instrumentation* FOR THE CHEMICAL INDUSTRY — BROWN INSTRUMENTS

IRON FREE—RAPID SOLUBILITY

Prove High Quality of Hooker Sulfides

Where you are using or considering using Sodium Sulfide or Sodium Sulfhydrate, you will do well to see how the high purity of these Hooker products can make your work easier and more effective.

Hooker Sodium Sulfide has a maximum iron content of 8 ppm and Sodium Sulfhydrate a maximum iron content of only 5 ppm. In developing these iron free sulfides, Hooker has also been able to keep them remarkably free from other impurities.

Rapid and complete solubility of these sulfides, a result of careful manufacture and high purity means that the clean solution can be used without settling or decanting—a time and material saving that is well worth while.

Large users of sodium sulfhydrate can obtain this Hooker product in liquid form in tank car quantities. It is supplied in concentrations of 37% or 45%.

Send for samples and Technical Data Sheets. Please make your request on your company letterhead.

SODIUM SULFIDE Na_2S

Mol. Wt. 78.1
M.P. .....100°C

Light buff colored solid in flake form. Rapidly soluble in water; slightly soluble in alcohol; insoluble in ether.

ANALYSIS

Na_2S ..... 60 to 62%
NaCl .....1.5% Max.
Other Na Salts ..... 2.0% Max.
Fe .....8 ppm Max.
Cu, Ni, Cr, Mn, Pb ...1 ppm Max.
Water of crystallization
36.5 to 34.5%

USES

In unhairing hides and wool pulling; desulfurizing viscose rayon; in manufacture of dyestuffs, chemical intermediates, paper pulp, soap and rubber, as an ingredient of dye liquor for textile dyeing; boiling out linen; ore flotation and metal refining.

SHIPPING CONTAINERS

Steel drums ..90 and 350 lbs. net

SODIUM SULFHYDRATE NaSH
(sodium hydrosulfide)

Mol. Wt. 56.1
M.P. .....55°C

Light lemon colored solid in flake form. Completely and rapidly soluble in water, alcohol and ether.

ANALYSIS

NaSH .....70 to 72%
Na_2S .....2.3% Max.
NaCl .....0.8% Max.
Na_2SO_3 and $NaHCO_3$ ..0.4% Max.
Fe .....5 ppm Max.
Cu, Ni, Cr, Mn, Pb ...1 ppm Max.
Water of crystallization ..28 to 26%

USES

In unhairing hides, in desulfurizing viscose rayon; in preparation of dyestuffs and other organic chemicals such as thioamides, thiourea, thioglycolic acid, thio- and dithiobenzoic acids, sodium thiosulfate.

SHIPPING CONTAINERS

Flake: Lacquer-lined steel drums, 90, 350 lbs. net
Liquid .....Tank Cars

HOOKER RESEARCH PRESENTS

SULFUR COMPOUNDS

Bulletin No. 9

Looking for a new organic sulfur compound? The answer to your problem may be found in this new Hooker bulletin. It lists typical processes and over 40 different organic sulfur compounds in 9 different classifications. These products are not all being manufactured, but they are all products we know how to make. As they are all typical products, they may suggest other materials of a similar type for which you may be looking.

Hooker does not offer ordinary sulfonations or sulfurized products. We do offer a variety of sulfides, mercaptans, thio acids, thiocyanates and other sulfur derivatives, many of which require our specialized processing ability.

If you have a potential requirement for a new organic sulfur compound, see what we can do for you. Write today on your business letterhead for your copy of Bulletin No. 9, Sulfur Compounds.

From the Salt of the Earth

HOOKER ELECTROCHEMICAL COMPANY

HOOKER CHEMICALS

5 FORTY-SEVENTH ST., NIAGARA FALLS, N. Y.
NEW YORK, N. Y. • WILMINGTON, CALIF. • TACOMA, WASH.

9-1448

SODIUM SULFIDE • SODIUM SULFHYDRATE • SODIUM BENZOATE • CAUSTIC SODA • MURIATIC ACID • PARADICHLOROBENZENE • CHLORINE

Announcing New GOULDS

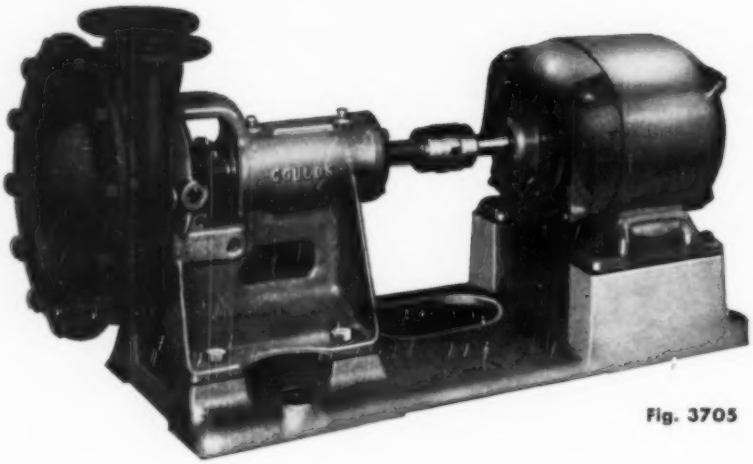


Fig. 3705

Outstanding service in handling corrosive liquids— *Goulds Stainless Steel Centrifugals*

Goulds Fig. 3705 Stainless Steel Centrifugals represent the last word in advanced pump design. Goulds Pumps, Inc., pump specialists for over 100 years, developed these pumps to give efficient, dependable service in the handling of corrosive liquids—at low cost.

Capacities up to 750 G.P.M.

Goulds stainless centrifugals are made in 8 sizes to cover all the usual requirements encountered in the process and other industries for handling corrosive liquids. Capacities range up to 750 G.P.M. with heads up to 180 ft., depending on capacity.

See this pump on display at our exhibit at the 22nd Exposition Chemical Industries, Grand Central Palace, New York, from November 28th to December 3rd. Booth 625.

Built for tough service

Goulds new stainless steel centrifugals are as simple as engineering ingenuity can make them. Every part that goes into these pumps is rugged enough to give you a large safety factor and long life—but there has been no wastefulness of expensive metals.

When you see the performance curves you will see that efficiency is high.

These stainless steel pumps are built for tough, twenty-four-hour service under the most exacting conditions.

MAIL COUPON FOR *FREE* COPY OF BULLETIN 725.3 GIVING COMPLETE DETAILS ON GOULDS STAINLESS STEEL PUMPS

Stainless Steel Pumps...

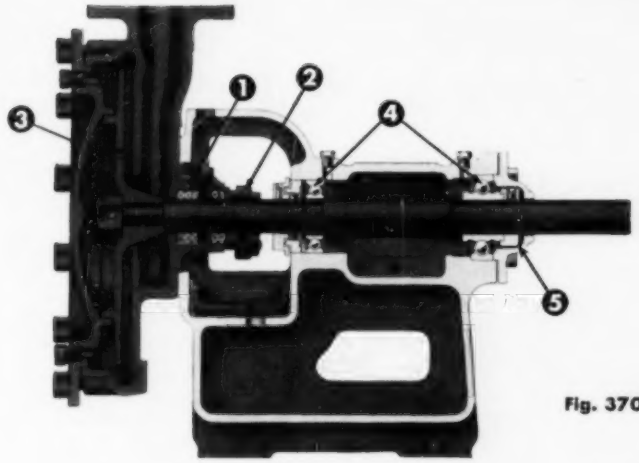


Fig. 3705

Outstanding economy in design and performance

Check these design features

1. Stuffing box under suction pressure only—This assures long packing life and freedom from excessive leakage.
2. Cowl type stuffing box gland split on 45° angle—Easy to disassemble. Single and double mechanical seals also available.
3. Piping connections in casing—You can inspect or clean pump by removing casing cover without disturbing connections. You may also remove impeller in the same way.
4. Bearings Prelubricated and fully protected from liquids pumped.
5. Can be adjusted for wear—If wear eventually occurs between impeller vanes and casing, you can adjust clearance using outboard bearing locking collar.

Materials of construction

Fig. 3705 is stocked in No. 316 and FA 20 stainless steel. Can be furnished in other metals or alloys to suit conditions of service. See Bulletin for complete specifications.

Interchangeable parts

Goulds paid particular attention to using interchangeable parts. You will need fewer spare parts for this new pump. See Bulletin for interchangeability chart.

For complete information on this advance design Stainless Steel Pump send coupon for FREE Bulletin.

MEMBER

GOULDS PUMPS INC.
Dept. CE, Seneca Falls, N. Y.

Please send your FREE Bulletin.

NAME _____

COMPANY _____

STREET _____

CITY _____ STATE _____

Goulds PUMPS INC.
Seneca Falls
New York

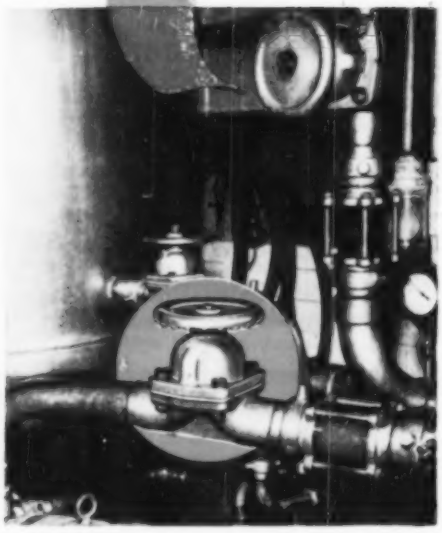
Which valve is the right one . . . for this spot?

This particular spot . . . a filter unit in a brewery stock house . . . is a most exacting one for a valve. As in other beverage, food and processing plants, closure must be positive. The flow passage must be smooth, streamlined . . . without pockets to trap fluid or solids. There must be no contamination of the fluid through contact with the working parts of the valve. Corrosive and sticky fluids must not corrode or clog the working parts or leak by the valve stem to drip on floors and equipment.

The valve for this spot is a Grinnell-Saunders Diaphragm Valve in which a flexible diaphragm presses down on a non-wearing seat for positive closure even when solid matter is trapped on the seat, and opens wide for streamlined flow. The diaphragm seals off the working parts of the valve from the fluid stream.

For this particular application the valve has a bronze body, polished to a satin interior finish; socket ends mean no pockets to trap the beer; a special white diaphragm imparts no taste or color to the beer and is unaffected by the caustic soda used for cleaning.

Just as this valve helps the brewing industry maintain the high quality of its products and keeps valve maintenance to a minimum, other Grinnell-Saunders Diaphragm Valves with the proper body, diaphragm and lining materials are eliminating "sore spots" in piping systems in other industries. Just one of the many products manufactured and distributed by Grinnell to do a better job . . . "whenever piping is involved."



Courtesy of P. Ballantine & Sons, Newark, N. J.

99 YEARS ... PIPING

GRINNELL

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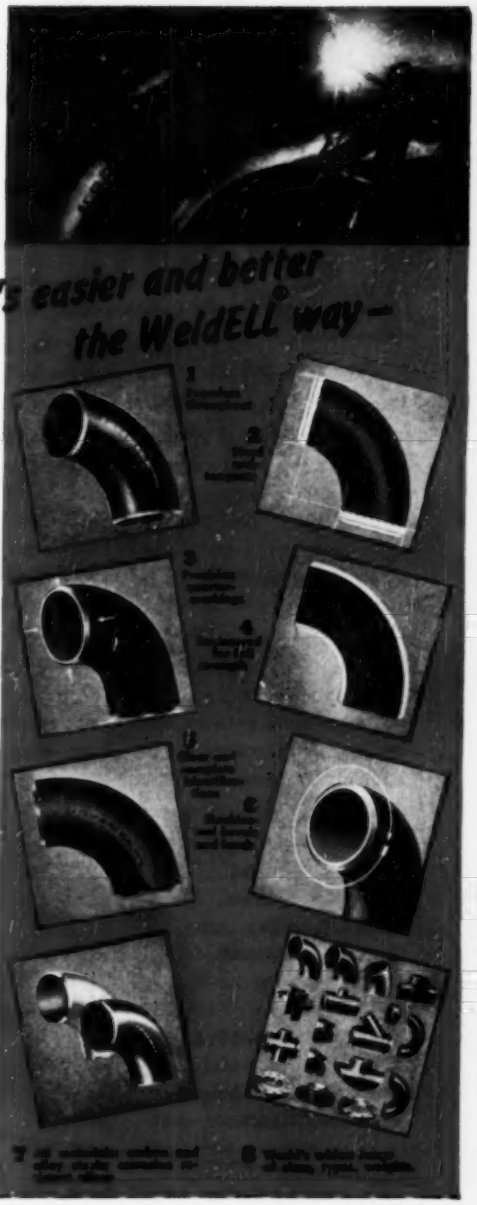

"Taylor Forge has thought of everything!"

A construction superintendent said it, but it has been expressed in one way or another by thousands of men who have lived and worked with Taylor Forge Welding Fittings and compared them with all other makes.

From the very start, Taylor Forge did the improving: set up a rigid, seemingly unattainable set of specifications for ideal welding fittings long before they were produced on a commercial scale.

But it was easier to think of everything than to accomplish it. Only the knowledge that Taylor Forge had accumulated, only the forging skills that Taylor Forge had developed, could have produced welding fittings that please alike the men who design piping, the men who erect piping, and the men who pay the bills.

Today in the WeldELL line, you have the fittings that *ask* for comparison. Some of their plus-value features—features that are combined in no other fittings—are pointed out here. Remember that the plus-value line is also the broadest line! Coupon brings catalog.

Taylor Spiral-Weld Pipe is again promptly available in a broad range of sizes and thicknesses. Coupon brings new Spiral Pipe Bulletin 493.

TAYLOR FORGE

TF

TAYLOR FORGE & PIPE WORKS P. O. Box 485, Chicago 90, Ill. • Eastern Plant: Carnegie, Pa. • Western Plant: Fontana, Calif. • District Offices: New York, Philadelphia, Pittsburgh, Houston, Los Angeles, Chicago.

☐ Please send new Catalog 484 covering welding fittings and forged steel flanges.

☐ Send new Bulletin 493 covering Taylor Spiral-Weld Pipe and related fittings.

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Position_____

Company_____

Street Address_____

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Mail to Taylor Forge & Pipe Works, P. O. Box 485, Chicago 90, Ill.

513-1249

AVOID THE LUXURY TAX
on Idle Horsepower

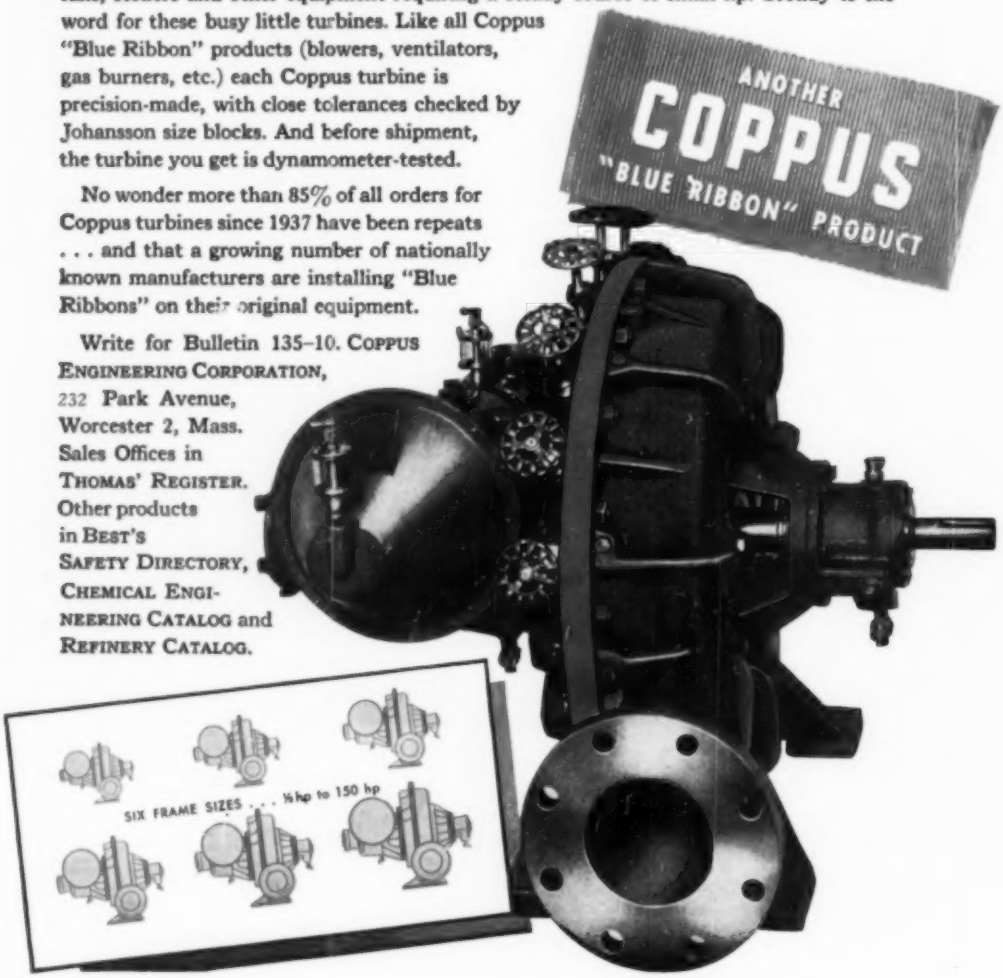
When your horsepower needs are small, why pay the extra cost of larger turbines, designed for much more power than you require?

You pay only for the horsepower you need when you fit the right Coppus "Blue Ribbon" Turbine to the load. They're made in six frame sizes . . . from 150 hp down to fractional . . . priced in proportion to their size.

That's why you'll see more and more Coppus turbines powering pumps, blowers, fans, stokers and other equipment requiring a steady source of small hp. *Steady* is the word for these busy little turbines. Like all Coppus "Blue Ribbon" products (blowers, ventilators, gas burners, etc.) each Coppus turbine is precision-made, with close tolerances checked by Johansson size blocks. And before shipment, the turbine you get is dynamometer-tested.

No wonder more than 85% of all orders for Coppus turbines since 1937 have been repeats . . . and that a growing number of nationally known manufacturers are installing "Blue Ribbons" on their original equipment.

Write for Bulletin 135–10. COPPUS ENGINEERING CORPORATION, 232 Park Avenue, Worcester 2, Mass. Sales Offices in THOMAS' REGISTER. Other products in BEST'S SAFETY DIRECTORY, CHEMICAL ENGINEERING CATALOG and REFINERY CATALOG.



Controlled Quality

gives you steel heat code protection

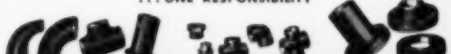
ON EVERY FITTING AND FLANGE IN THE COMPLETE LADISH LINE

Pioneered by Ladish . . . and long recognized as its symbol of Controlled Quality . . . the Ladish steel heat code is visible evidence of added reliability resulting from metallurgical integrity. It protects you with certified laboratory reports always available giving specific test data as proof that all requirements of standard or special specifications are met or exceeded.

L

TO MARK PROGRESS

A COMPLETE LINE PRODUCED UNDER ONE ROOF
. . . ONE RESPONSIBILITY



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MILWAUKEE SUBURB

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THE FITTINGS LINE INCLUDING CARBON, ALLOY AND STAINLESS STEELS, ALUMINUM, BRASS AND COPPER THAT IS COMPLETE IN TYPES, SIZE RANGES AND MATERIALS

Hudson River Water made Hospital Clean!

Completely enclosed ACCELATOR ® at Winthrop-Stearns Inc., Rensselaer, N.Y.

3500 gpm Accelator 49' in diameter by 18' deep

Four Gravity Filters with Palmer Filter Bed Agitators

Dry Chemical Feeders for Alum, Lime, Soda Ash, Activated Carbon

INFILCO Equipment Makes Hudson River Water Safe for the Manufacture of Pharmaceuticals!

WINTHROP-STEARNS INC. now can get a 3500 gpm *crystal clear* turbidity-free water supply at a chemical cost of only about *1 to 1½¢ per 1000 gallons.* INFILCO Equipment, including the ACCELATOR, Dry Chemical Feeders, and Filters, convert Hudson River water into a supply so pure that it meets the exacting requirements for the manufacture of pharmaceutical products and general plant use. Turbidity is reduced to 0!

Space required for the entire plant is very small. The diameter of the ACCELATOR is only 49 feet . . depth 18 feet. Two Dry Chemical Feeders handle either alum, lime or soda ash. One Dry Chemical Feeder handles activated carbon. A batch type activated Silica Feeder and four Gravity Filters complete the installation.

INFILCO Equipment is now conditioning ONE BILLION gallons of water every day! Get complete information. Ask for new Bulletin No. 1825. Write today!

INFILCO

* BETTER WATER CONDITIONING AND WASTE TREATMENT SINCE 1894 *

INFILCO INC.

GENERAL OFFICES: 325 WEST 25th PLACE • CHICAGO 16, ILLINOIS

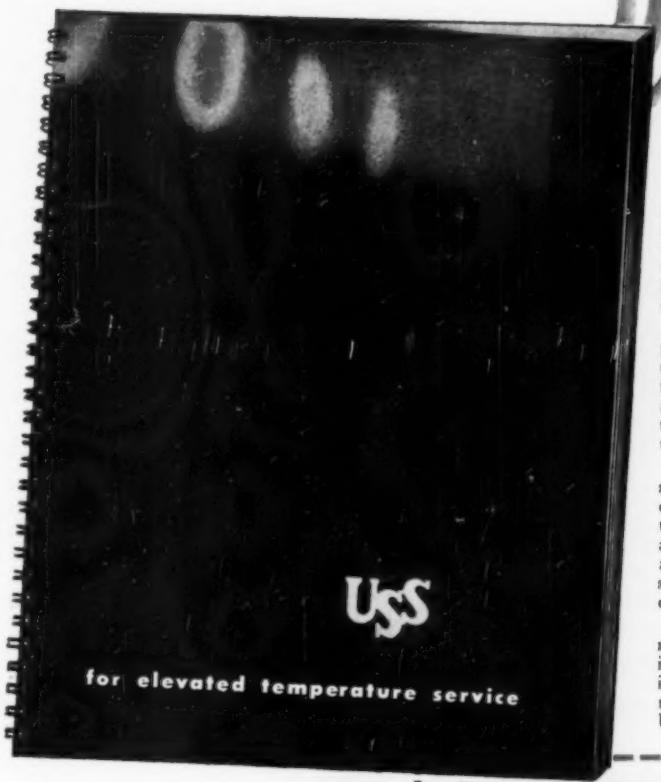
SALES OFFICES IN TWENTY SIX PRINCIPAL CITIES

WORLD'S LEADING MANUFACTURERS OF WATER CONDITIONING AND WASTE TREATING EQUIPMENT

"Steels for elevated temperature service"

A new, authoritative book on this important subject . . .

yours for the asking!



JUST PUBLISHED, this book is the result of 15 years' study of high temperature problems by United States Steel Corporation and its manufacturing subsidiaries.

It is designed to be helpful to engineers, metallurgists and chemists in their quest for suitable structural materials that will maintain adequate strength under the elevated temperatures involved in the power, petroleum, transportation, chemical, and other industries having similar problems.

In its pages are discussed the general principles of behavior of ferrous materials under elevated temperatures, the various factors that influence this behavior, as well as the special testing equipment and laboratory technique used to evaluate the elevated temperature properties of steel.

In the comprehensive data section, the significant property values of *twenty-one* different steels, suitable for use at elevated temperatures, are presented both in tabular and graphical form. Characteristics such as high temperature strength, corrosion resistance, weldability and others are discussed.

Much of the information in this book has never before been published. You'll find it invaluable as a reference if your work involves the operation of equipment that must function at elevated temperature. Use the coupon.

Listen to...The Theatre Guild on the Air, *presented every Sunday evening by United States Steel, National Broadcasting Company, coast-to-coast network. Consult your newspaper for time and station.*

United States Steel Corporation Subsidiaries
Room 2119, Carnegie Building, Pittsburgh 30, Pa.

☐ **Please send me the new book, "Steels for Elevated Temperature Service."**

☐ **Please have a representative call on me.**

Name.....Position.....

Company.....Address.....

City.....Zone.....State.....

CARNEGIE-ILLINOIS STEEL CORPORATION, PITTSBURGH & CHICAGO
COLUMBIA STEEL COMPANY, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
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UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

UNITED STATES STEEL

Light in Weight

YET THE

Strongest Shipping Bags Made

BEMIS

Waterproof Laminated Textile BAGS

BEMIS BRO. BAG CO.

Waterproof Department, 408 Pine St., Box 15
St. Louis 2, Missouri

MAIL THIS COUPON TODAY

Bemis Bro. Bag Co., Waterproof Department
408 Pine Street, Box 15, St. Louis 2, Missouri
Please send complete information on advantages of Bemis Waterproof Bags for shipping _____ (PRODUCT)

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"America's No. 1 Bag Maker"

In Industrial Construction you need all THREE to be Sure!

SOUTHLAND PAPER MILLS, Inc.
Lufkin, Texas

The ability of any construction organization to serve YOU depends chiefly on the collective abilities of its personnel, its equipment and its experience to solve YOUR problems quickly and smoothly, without loss of time or waste of materials.

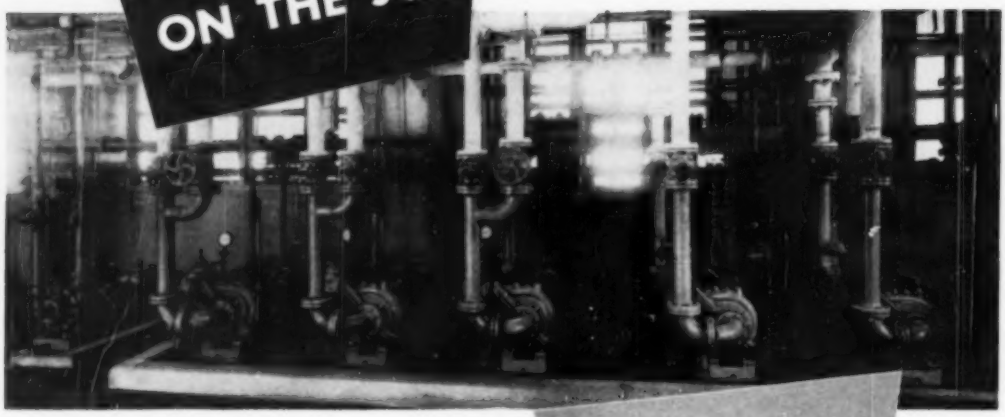
When you call upon Merritt-Chapman & Scott Corporation to handle your next construction problem you can rest assured that all three of these important services—trained personnel, proper equipment, and long nationwide experience will be at your disposal. Especially proud of its accomplishments in the exacting chemical field, the Corporation can point to many successful projects now in operation.

Write for our interesting booklet "Industrial Plants and Buildings" for the cross-section story of how Merritt-Chapman & Scott Corporation can help you build.

YOUR CONFIDENCE IS JUSTIFIED

MERRITT - CHAPMAN & SCOTT CORP.
General Offices: 17 Battery Place, New York 4, N. Y.

As Good or Better ON THE JOB



WHEN your pump is installed and operating—that's when the real test of efficiency and durability comes in! And "Buffalo" Chemical Pumps are passing this test industry-wide. First, as specifications show, "Buffalo" Pumps are strictly heavy-duty in every part. Lightweight or "temporary" pumps are not part of our line. Second, "Buffalo" Pumps are built to give you the highest possible efficiencies for the job—which means power economy year after year. And third, they are built of materials to handle YOUR particular chemical liquids on a long-term, trouble-free basis.

As on PAPER

PERFORMANCE SPECIFICATIONS
BUFFALO CHEMICAL PUMPS

LEAD - ACID						
RUBBER - LINED						
DIAGONALLY SPLIT						
SHELL						
ALLOY PUMPS						

Write for Bulletin 982, left, for the reliable performance data on these pumps that are ready to "live up" to these specifications in your plant.

"Buffalo" PUMPS

BUFFALO PUMPS INC.

501 BROADWAY BUFFALO, NEW YORK

Canada Pumps, Ltd., Kitchener, Ont.

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

A-B-C's of Permanent-Magnetic Separators

A. MATERIAL SELECTION

The type of alnico used (there are 12 grades) in a permanent magnet determines the "potential" strength. The strength of alnico is measured in terms of "External Energy" which is analogous to watts in electricity. For example, Alnico I has an external energy potential of 1,350,000 while Alnico V has from 4,500,000 to 5,000,000. Other grades of Alnico, used in some cases by separator manufacturers, are far less expensive but due to their low energy potential, should not be considered when producing a permanent magnet. In buying permanent magnetic separators, insist on properly selected Alnico materials.

PIONEERED BY *Eriez*

Permanent Magnetic Separators for tramp iron removal are now recognized throughout industry as safe, dependable, efficient and economical. For a number of years, Eriez pioneered this development alone. Strict Eriez qualifications as to material, strength and design are responsible for the rapid and wide acceptance of permanent non-electric magnetic separators. Eriez, from the first, a leader in design, experience, and understanding of permanent magnetic separation, is best qualified to give you (1) the most efficient magnets available, and (2) experienced application engineering. If you have a ferrous metal separation problem, it will pay you to investigate the complete line of Eriez Permanent Non-Electric Magnetic Separators.

B. DESIGN "KNOW HOW"

Top grade alnico material can be used in a permanent magnet and yet the unit can be far from satisfactory. Alnico materials are very critical in respect to design. Thorough knowledge of Alnico properties . . . "know how" design wise, is of first importance to design magnetic castings correctly and to obtain maximum external energy. Eriez, through its years of experience, designing permanent magnets only, can now invariably approach this maximum very closely because Eriez Engineers Know How.

C. ENERGIZING TECHNIQUE

The last phase in producing a permanent magnet of maximum external energy requires correctly designed powerful energizing equipment plus the correct charging technique. Specially built equipment, designed and maintained for this use only, packs the power into Eriez Non-Electric Permanent Magnetic Separators.

Write, wire or phone Eriez Manufacturing Co., 5116 East 12th St., Erie, Pa., U. S. A. Representatives in all principal cities.

Pioneer of PERMANENT Magnetic Separation

Thomas Chemical Engineering Catalog

See our catalog P $\frac{1b}{2}$ Sweet's Processing Industries File

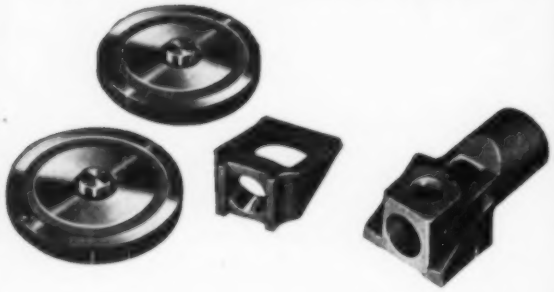
Visit us at the Plant Maintenance Show, Cleveland, Ohio Booth #443—January 16-17, 1950

ERIEZ MANUFACTURING COMPANY

5116 East 12th St. • ERIE, PA.

How Darling features prevent trouble and expense

Simplified Maintenance



DESIGNED for extreme simplicity, with all parts interchangeable, Darling Fully Revolving Double Disc Parallel Seat Gate Valves assure easy inspection and unsurpassed maintenance economy.

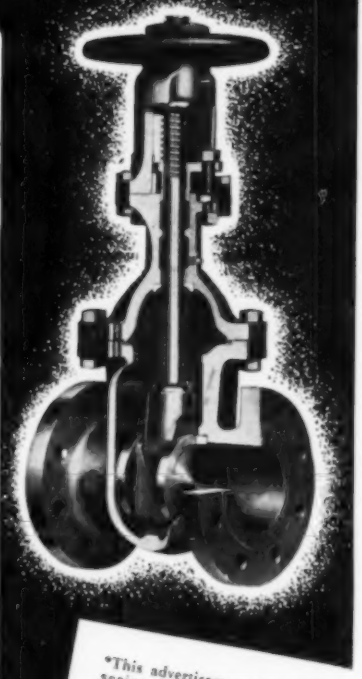
There they are—just four simple gate parts, two plain discs and two wedges . . . readily and quickly removed or replaced as a unit, without disturbing the valve body. Moreover, since the discs are entirely independent and interchangeable, new discs can be installed without laborious bench work or fitting. Likewise, seat rings are made with lugs for easy removal and replacement without removing the valve body from the line.

Extra deep stuffing boxes provide ample packing space. Independent gland bolts permit adjustment or replacement of packing without disturbing the stuffing box bolts.

Finally, *all* Darling Gate Valve parts are made to established engineering standards, beginning with rigid metallurgical specifications, then controlled all along the way with gauges and templates for complete dimensional accuracy.

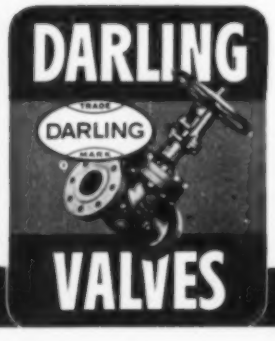
So for low maintenance cost and minimum parts inventory, for long-range economy in *every* way, specify Darling Fully Revolving Double Disc Parallel Seat Gate Valves.

DARLING VALVE & MANUFACTURING CO.
Williamsport 3, Pa.



*This advertisement is one of a series showing how the unique Darling Fully Revolving Double Disc Parallel Seat Gate Valves answer the following critical operating problems:

- Positive, easy closing—regardless.
- Automatic adjustment for valve body distortion.
- Elimination of disc-to-seat friction and galling.
- Uniform wear distribution.
- Extreme simplicity.
- Greater service life.
- Simplified maintenance.



Outline your service requirements and get complete information on Darling Valves of the proper type. Or, send for the complete 300-page Darling Catalog No. 17M. It describes Darling Valves of all types for every normal or unusual service, and for pressures up to 1500 pounds. It's full of helpful information . . . Yours for the asking.

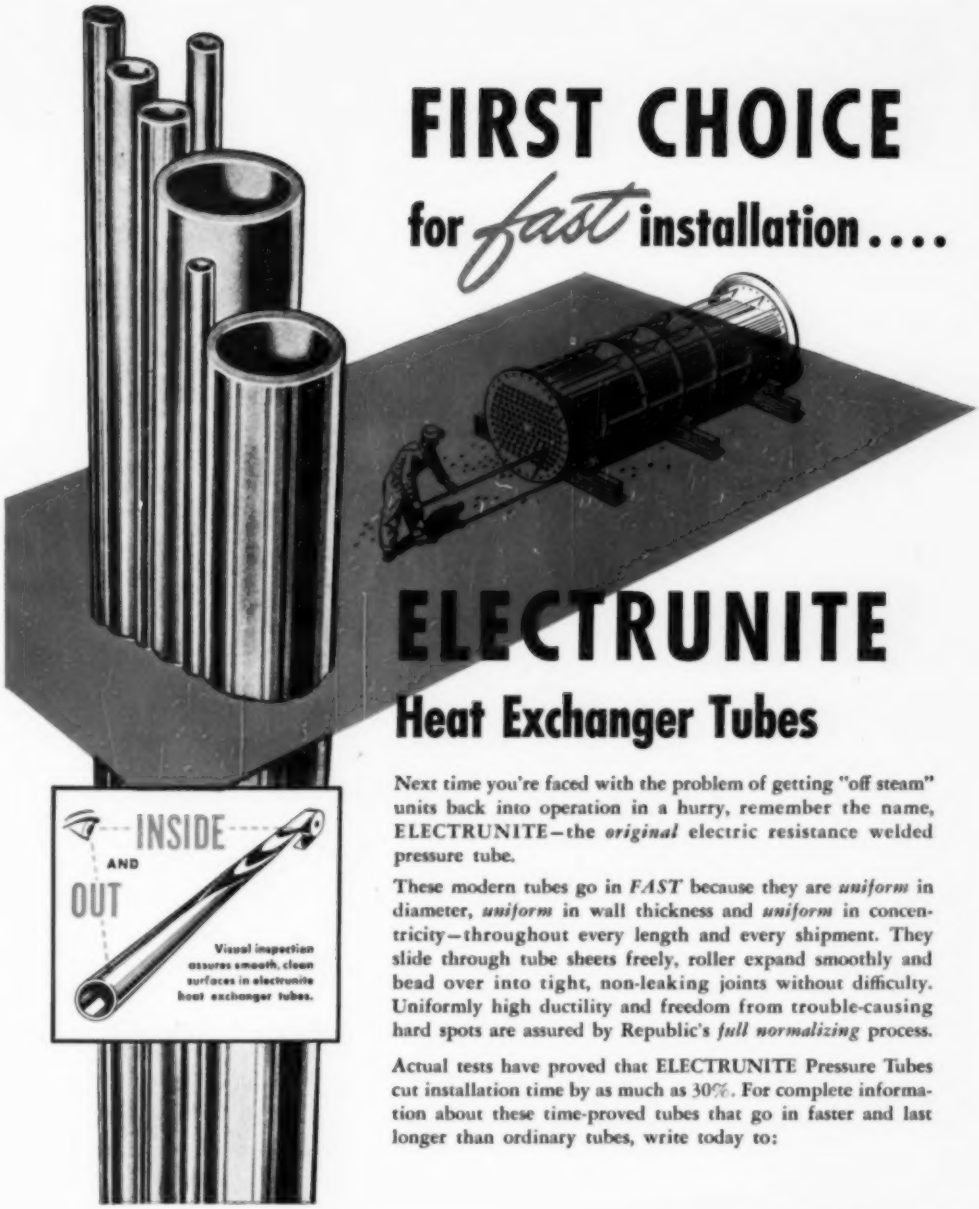
CORROSION RESISTANT VALVES

In addition to conventional iron, bronze and steel constructions, Darling specializes in valves for any corrosive fluid: iron body valves with special alloy trim; iron body, rubber lined, with special alloy trim; all bronze; and all special alloy. Darling's 30 years of experience in meeting unusual requirements is always at your service.

THE VALVE MARK OF QUALITY . . . WATCH FOR IT

FIRST CHOICE

for *fast* installation....



ELECTRUNITE

Heat Exchanger Tubes

Next time you're faced with the problem of getting "off steam" units back into operation in a hurry, remember the name, ELECTRUNITE—the *original* electric resistance welded pressure tube.

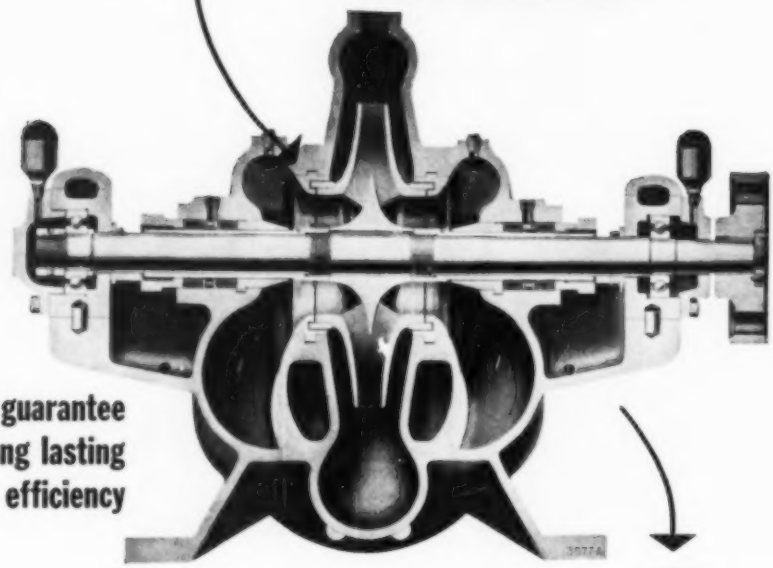
These modern tubes go in *FAST* because they are *uniform* in diameter, *uniform* in wall thickness and *uniform* in concentricity—throughout every length and every shipment. They slide through tube sheets freely, roller expand smoothly and bead over into tight, non-leaking joints without difficulty. Uniformly high ductility and freedom from trouble-causing hard spots are assured by Republic's *full normalizing* process.

Actual tests have proved that ELECTRUNITE Pressure Tubes cut installation time by as much as 30%. For complete information about these time-proved tubes that go in faster and last longer than ordinary tubes, write today to:

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION • CLEVELAND 8, OHIO
Export Dept.: Chrysler Bldg., New York 17, N.Y.

Republic REPUBLIC STEEL
ELECTRUNITE
BOILER, CONDENSER AND HEAT EXCHANGER TUBES

Look ... for the Labyrinth!



it's your guarantee of long lasting efficiency

When you buy a pump equipped with De Laval wearing rings you can be sure that it will retain its high original efficiency, undiminished year after year. That's because leakage from discharge to suction increases but little as the pump wears.

Look at the illustration above and you'll see how the passages through the labyrinth ring retard the flow at the running joint between impeller and casing. The sealing action of these rings does not depend upon the maintenance of close clearances—subject to erosion and enlargement—as does that of the flat ring. As a result, their efficiency is but little affected by wear. With De Laval labyrinth rings the savings grow greater, year after year.

De Laval Catalog 10-16-M describes this and other features that you should investigate before buying a centrifugal pump.

DE LAVAL LABYRINTH RING
Tortuous passages retard flow.

ORDINARY FLAT RING
Close clearances retard flow.

DE LAVAL

DE LAVAL STEAM TURBINE COMPANY, TRENTON 2, N. J.

TURBINES • HELICAL GEARS • CENTRIFUGAL BLOWERS AND COMPRESSORS
CENTRIFUGAL PUMPS • WORM GEAR SPEED REDUCERS • IMO OIL PUMPS

10-16

NATIONAL
NATIONAL
NATIONAL AER-O-FOAM LIQUID
NATIONAL 99 FOAM CHEMICAL
NATIONAL 2 IN 1
EVERY PROTECTION NEED
EVERY ONE FIRE TESTED
Whether it is fire nozzles . . . a complete foam system . . . or just a refill can of AER-O-FOAM liquid, National Foams can supply your every need for safely protecting your plant. Each and every product has been "Fire-Tested" and performance-proved in fighting flammable liquid fires in the chemical industry.
National "Fire-Tested" Products include all types of chemical and mechanical foam charges, foam nozzles, foam chambers, foam makers, pump and pressure proportioners, overhead spray deflectors and many sizes of foam generators. For quick on-the-spot protection, National offers chemical plants complete foam fire fighting units—trucks and trailers specially fitted for fighting flammable liquid fires.
National Foam System makes and engineers the installation of complete foam fire protection systems . . . performance-proved to give the chemical industry safe, sure protection at all times. Call on our engineers for "Fire-Tested" equipment . . . write for complete catalog.
NATIONAL FOAM SYSTEM, INC.
Headquarters for Foam Fire Protection
Packard Building, Philadelphia 2, Pa.

For OUT-SIDING...IN-SIDING...and CEILING, too

K&M "Century" APAC filled the bill

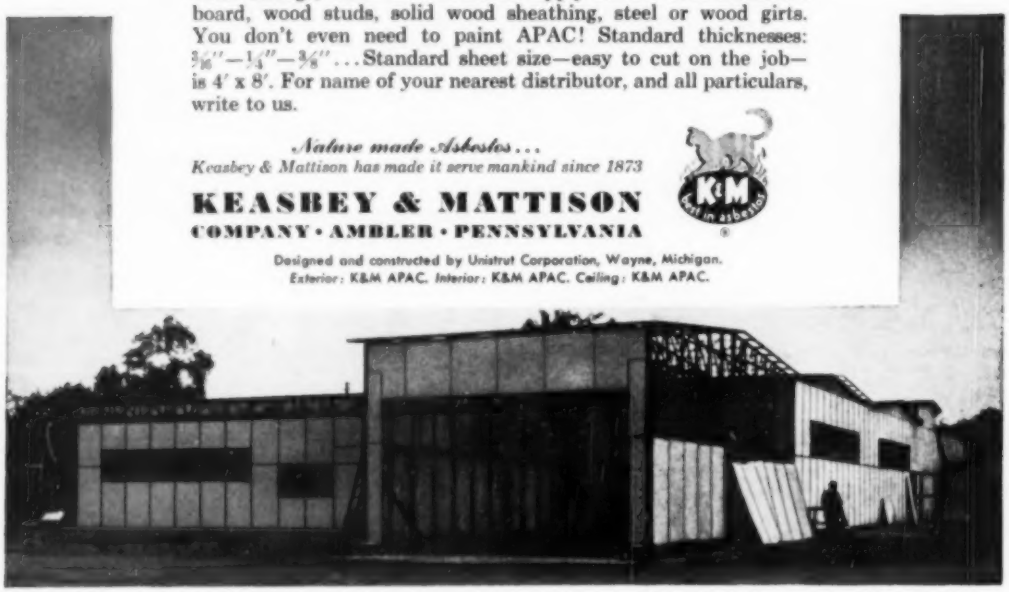
The total bill for the job was held down by the K&M APAC Asbestos-Cement sheets used for all walls and the ceiling of this serviceable structure. And no bill for APAC maintenance is ever even likely. The same sort of economy goes with K&M APAC on any project. Enclosure is quicker because APAC sections—large, strong, but not bulky—are easy to handle. Permanence is as certain as it can be made by a material that defies weather and fire, rust and rot, rodents and termites.

The K&M APAC Asbestos-Cement formula gives you a tough, attractive, money-saving material for panels, partitions, sheathing, shaft casings, bins—all flat areas. Apply APAC over insulation board, wood studs, solid wood sheathing, steel or wood girts. You don't even need to paint APAC! Standard thicknesses: $\frac{3}{16}$"—$\frac{1}{4}$"—$\frac{3}{8}$"... Standard sheet size—easy to cut on the job—is 4' x 8'. For name of your nearest distributor, and all particulars, write to us.

Nature made Asbestos...
Keasbey & Mattison has made it serve mankind since 1873

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

Designed and constructed by Unistrut Corporation, Wayne, Michigan.
Exterior: K&M APAC. *Interior:* K&M APAC. *Ceiling:* K&M APAC.



These Routes Lead to Economy

● To serve customers more economically, Mathieson has strategically located not one but three great tide-water plants.

From these deep-water ports Mathieson is able to move economically large tonnages of heavy chemicals, new, improved fertilizers and special chemicals through low-cost shipping over inland waterways, along the coast or across the seven seas.

Reflected also in Mathieson chemicals are the customer benefits accruing from the efficient handling of incoming raw material at these tide-water ports.

Mathieson's constantly improving and expanding facilities for research, production and delivery are the result of one aim – to provide chemicals for the betterment of industry, agriculture and public health.

Mathieson
CHEMICALS

SERVING INDUSTRY, AGRICULTURE AND PUBLIC HEALTH

Mathieson Chemical Corporation
MATHIESON BUILDING,
BALTIMORE 3, MARYLAND

"V-Belt Inventory? ... it's no problem since we standardized on VEELOS!"

4 REELS OF VEELOS *replace* 316 SIZES OF ENDLESS V-BELTS

Write for your VEELOS Data Book... it's free and it's full of engineering, measuring and installation information on Veelos. Everyone interested in power transmission should have a copy for ready reference.

MANHEIM MANUFACTURING & BELTING CO.
MANHEIM, PENNSYLVANIA

"I DON'T like to tie-up operating capital . . . who does? That's why, in our plant, we use Veelos on all v-belt drives. In the old days our stockroom was a dangling mess of endless v-belts. But no more. Now, on wall space only sixteen inches square, hang 4 reels of Veelos. Those 4 reels in O, A, B and C widths take care of *all* our v-belt needs. Simple story sure, but a sound, practical picture of saving money the Veelos way."

And there are other advantages beyond the saving of inventory when you standardize on Veelos, the adjustable v-belt. Veelos is easy to install—just measure and couple. You never dismantle outboard bearings to replace Veelos v-belts—that keeps machine downtime at rock bottom. Uniform operating tension, smooth, vibrationless power delivery and long life are more plus values from Veelos.

ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

VEELOS
THE LINK
V-BELT

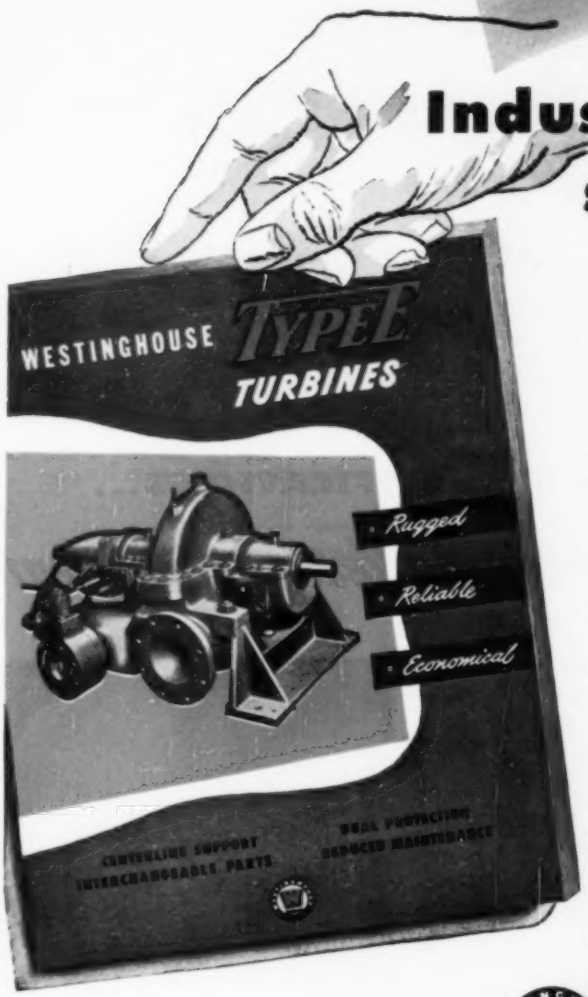
Veelos is made in all standard sizes; fits all standard v-belt grooves. Packaged on reels in 100-foot lengths. Sales engineers in principal cities; over 350 distributors throughout the country. Veelos is known as VEELINK outside the United States.

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

Compare it on ANY count

Industry's *new* steam drive



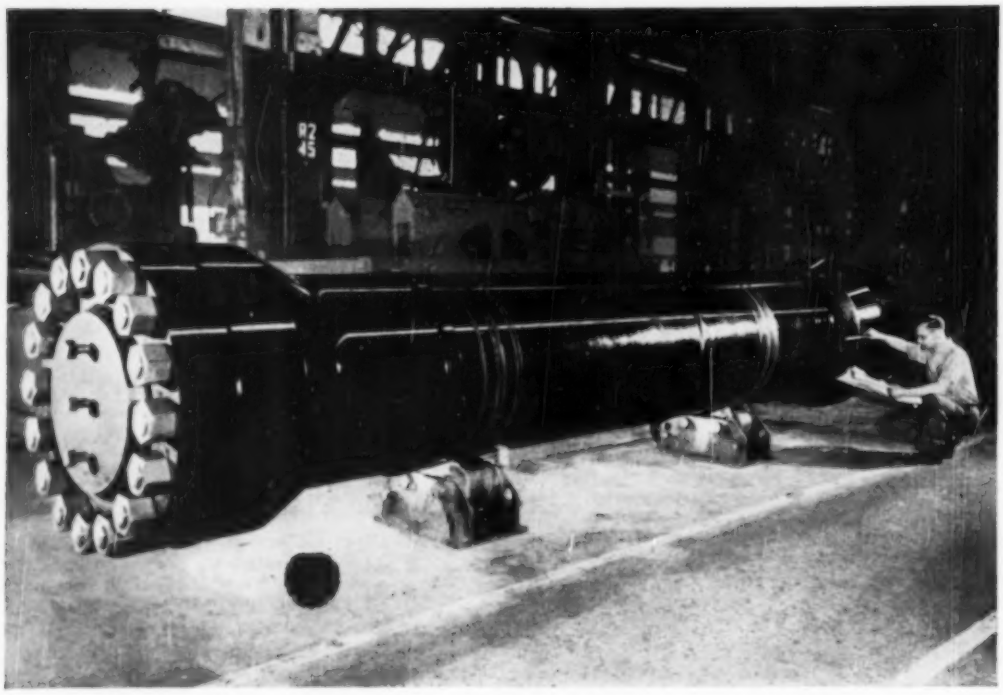
Here's the new general-purpose turbine that meets the increasingly rigid demands of modern industry. Wrapped up in one *standard* unit are the best features of previous Westinghouse drives . . . plus important refinements and new developments, including features formerly obtainable only as costly "specials"

The new "Type E" is designed to operate reliably and efficiently where the going is tough. It's built to give trouble-free, economical performance for long periods of continuous operation . . . or instant operation when used as a standby drive . . . regardless of operating conditions.

Weatherproof bearing seals, corrosion-resisting gland zones, centerline support for freedom of expansion and contraction, dual protection against overspeed, floating movement of governing and trip linkages, and parts interchangeability between wheel sizes are among the many advantages built into the new "Type E" drives.

← **GET THE FACTS.** We invite your comparison. For the full story, call your nearby Westinghouse office. Ask for the "Type E" Turbine book B-3896, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna. J-50498-A

Westinghouse TYPE E Turbines



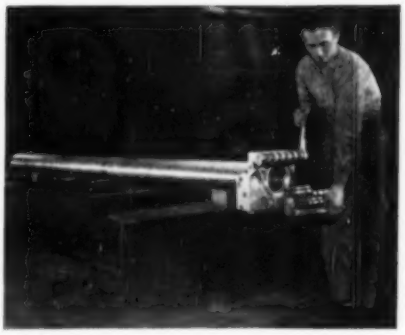
GIVE US YOUR SPECIFICATIONS...

We'll Build the Pressure Vessel You Want

If you're considering forged-steel pressure vessels, we'd like to talk over your requirements, show you the types of vessels produced in our shops, and explain how we go about meeting your specifications.

A builder of long standing in this field, Bethlehem can be counted on for top-quality work—the kind that will stand up safely for years under the pressures intended. Our forging method produces a vessel that is seamless and uniformly strong, a vessel that thoroughly merits your trust.

At Bethlehem both carbon and alloy steels are available for this purpose, as you specify. Talk with our engineers before placing new business. They will be glad to work closely with you.



BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

★ BETHLEHEM STEEL ★

ATLANTIC PETROLEUM CHEMICALS

ULTRAWET 60L

This BRAND NEW liquid Ultrawet is crystal-clear even below 20° F

Atlantic Research has added a really amazing detergent to the ULTRAWET line of "tailor-made" surface-active agents. ULTRAWET 60L is a liquid organic alkyl aryl sulfonate; it is 60% active and 40% water. It has superior wetting, high-foaming, and excellent penetrating characteristics. In addition this newly developed ULTRAWET 60L remains *crystal-clear* even below 20 degrees Fahrenheit. These are properties not exhibited by any other commercial detergent for the money.

If you are selling a liquid detergent for household or institutional use, the solubility of ULTRAWET 60L is a real sales advantage. It is outstanding, too, for shampoos and other cosmetic applications. Its *extra* solubility offers much for textile and other industrial wet processes. It is available in drums and tank cars. ULTRAWET 60L is just one of many ULTRAWETS, each one of which is designed for specific applications and processes.

APPLICATIONS	ULTRAWETS					
Form:	30E Liquid	30DS Liquid	35K Liquid	60L Liquid	DS Flake	K Flake
Minimum % Solids:	30	30	35	60	95	95
Minimum % Active-Solids:	85	85	90	60		
EMULSION BREAKING	✓					
LIGHT-DUTY HOUSEHOLD DETERGENTS			✓			
PENETRANT	✓	✓				
INDUSTRIAL DETERGENTS					✓	✓
HEAVY-DUTY HOUSEHOLD DETERGENTS			✓			✓
EMULSIFIER					✓	✓
WETTING AGENT	✓	✓				
CHARGE STOCK FOR SPRAY AND DRUM DRYING			✓			
DRY MIXING WITH ALKALIS					✓	✓
LIQUID HOUSEHOLD DETERGENTS		✓				
COUPLING AND SOLUBILIZING	✓					

For samples, further information and quotations, communicate with

THE ATLANTIC REFINING COMPANY

Chemical Products Section

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Chamber of Commerce Building, Pittsburgh 19, Pa.
Hospital Trust Building, Providence 1, R. I.
1112 S. Boulevard Street, Charlotte 3, N. C.
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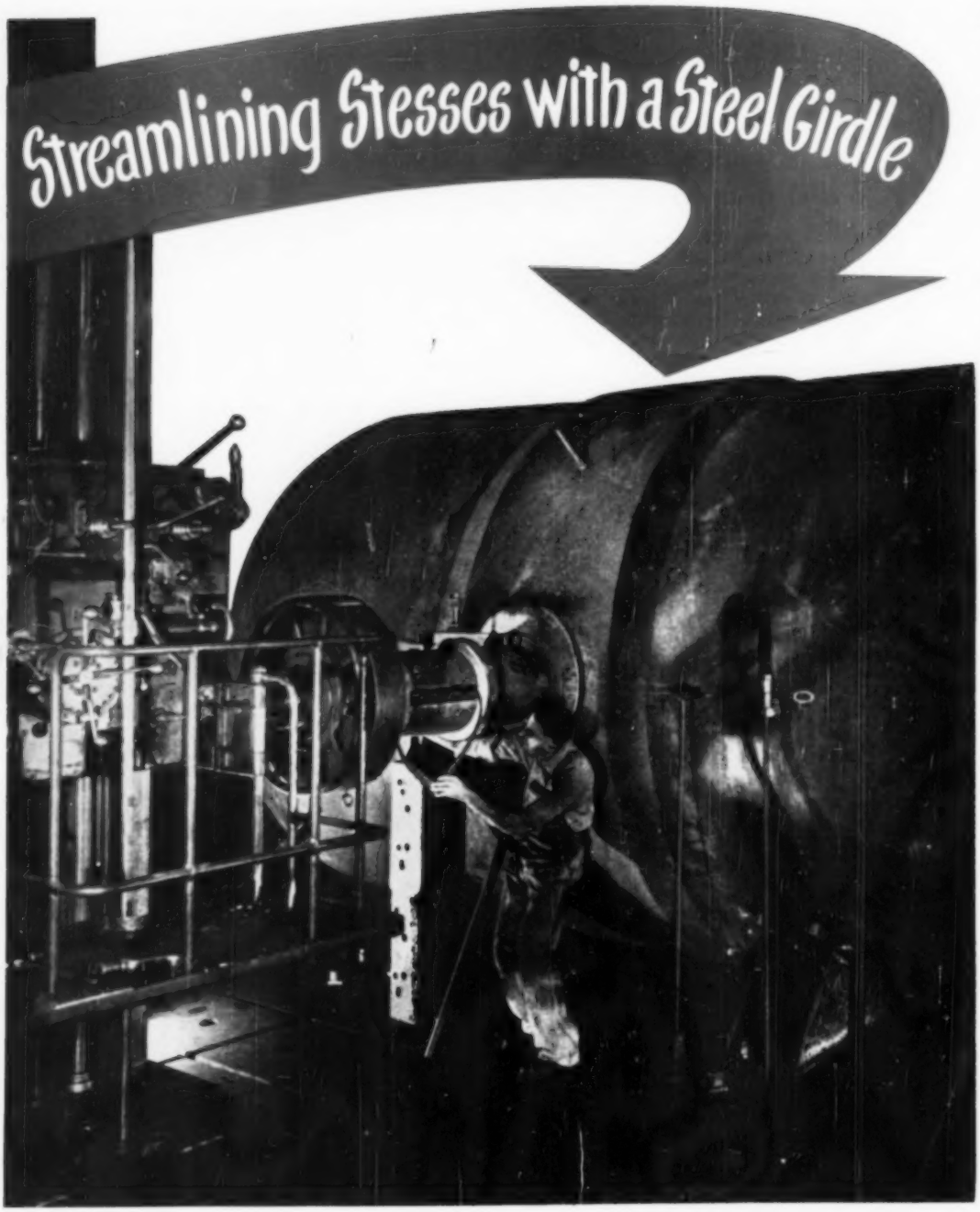
L. H. BUTCHER COMPANY • San Francisco • Los Angeles
Seattle • Salt Lake City • Portland • Oakland

NAUGATUCK CHEMICALS
Division of Dominion Rubber Co. Ltd., Canada
Elmira • Montreal • Toronto • Windsor
Winnipeg • Saskatoon • Calgary

Streamlining Stresses with a Steel Girdle

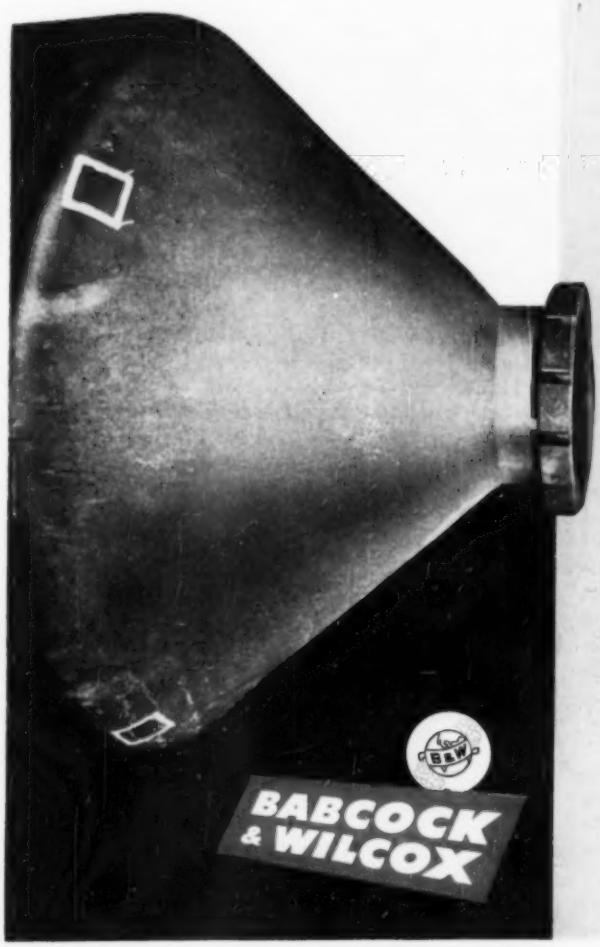


. . . adds life to Process Equipment

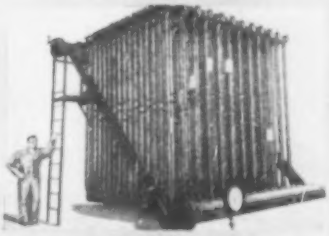
Typical of the research, engineering, and fabricating facilities of B&W's Process Equipment Division is the solution of this tough problem of *chemical* corrosion.

PROBLEM: Investigation of corrosion in pulp digesters showed that it invariably started and developed to dangerous proportions inside the shell immediately surrounding the through-shaft of conventional rotary types. Experiments indicated that concentration of mechanical stresses at these points of support was a powerful inducement to corrosion, even though the materials used in construction were well suited, metallurgically, to withstand the corrodants encountered under normal conditions.

SOLUTION: The digester design was revised to eliminate the through-shaft and substitute two separate trunnions, welded to a heavy steel girth-band in such a way that weight-stresses are distributed more uniformly over a large area of the shell. Digesters of this *patented* B&W construction have outlived previous types in identical service by a wide, money-saving margin.

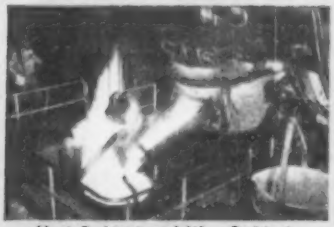


Plain and Clad Pressure Vessels



Heat Exchangers

Accumulators



Heat-Resistant and Wear-Resistant Castings

SOLVING NEW PROBLEMS IN PROCESS EQUIPMENT... an old story with B&W

Solution of unusual problems such as the one outlined here is another of the many "plus" values that can reduce maintenance and operating costs of *your* next project. For expansion, modernization, or original installation of processing equipment, B&W offers a broad range of research, engineering, and production experience well worth your investigation.

S-85

YOU CAN'T AFFORD TO IGNORE THIS OFFER *(REALLY)*

There's a well equipped laboratory, staffed with highly trained and skilled technicians ready to go to work for you tomorrow morning—at no cost to you and without one iota of obligation on your part.

The laboratory is maintained by Proctor & Schwartz, Inc., of Philadelphia, designers and manufacturers of industrial drying equipment. It is operated for the *mutual* benefit of industries with drying problems—and, of course, for Proctor & Schwartz. We'd be utterly foolish to even intimate otherwise.

Into this laboratory every day, come widely divergent drying problems from many different industries and all parts of the world. Proctor engineers, utilizing all of the resources at their command, try to solve these problems. Some can be solved with a few hours of test work. Others take months of study and some remain unsolved or prove impractical. The manufacturer who places his drying problem in Proctor engineers' hands, has taken the first step in the right direction, for these men are trained in the art of drying, they have at their fingertips important data and findings of drying studies made during the last half century. For all of this, the prospective customer does not pay one penny. Of course, as each new problem comes in, it is our hope that the solution will indicate a place for the application of Proctor drying equipment. You can't blame us for that. However, often the results of much comprehensive study will reveal some other drying process to be the answer—rather than the atmospheric type of equipment manufactured by Proctor & Schwartz.

In that case, the results of the research are discussed with the client—They say, "thank you", we say, "you're welcome, sorry that your product isn't suited to our particular type of equipment". No money exchanges hands—for remember, we said, "no cost or obligation".

If the study indicates Proctor equipment to be suitable—the findings of the research are passed on to the preliminary engineering department and recommendations for a dryer design are made.

Regardless of the outcome of the research, YOU STAND TO BENEFIT. If it indicates Proctor equipment is not the answer—you've had $100 or $1,000 worth of research conducted for you absolutely free. If it finds Proctor equipment suited to your needs—you have the assurance that your drying equipment recommended, will be engineered on FACTS to suit your individual needs . . . and you'll still pay nothing for the research and test work.

See what we mean—you can't afford to ignore this offer. If you have a drying problem, don't waste time, manpower and money trying to solve it. Turn it over to Proctor engineers. IT WILL NOT COST YOU ONE RED CENT TO ENLIST THEIR AID AND SKILL. Write today . . . or call MIchigan 4-6400. If you are not considering a drying problem at the moment—tear out this page so that you will not forget it when a problem comes along.

PROCTOR & SCHWARTZ, INC.
711 TABOR ROAD
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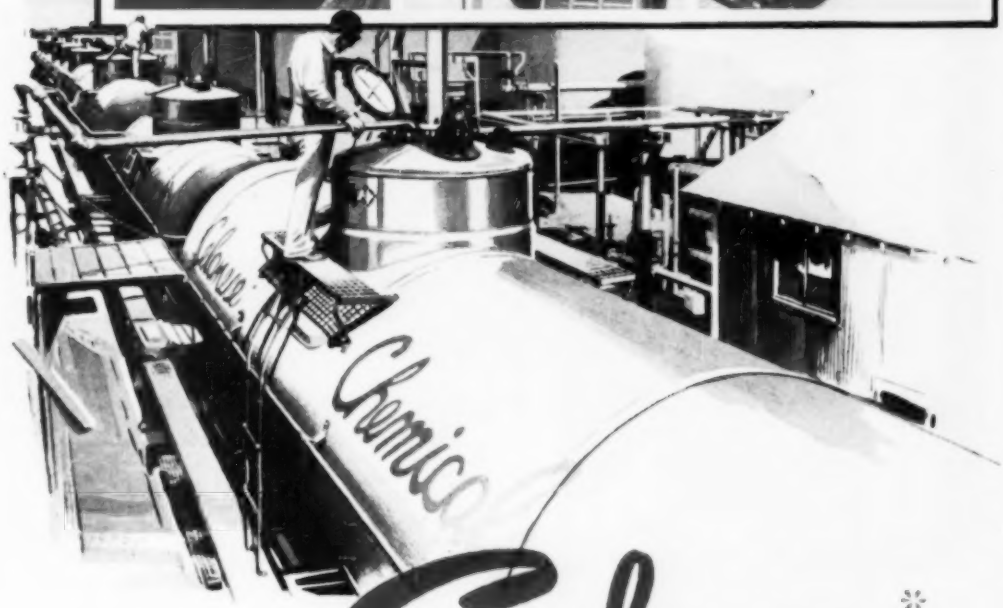

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PROPYLENE GLYCOL
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CELANESE CORPORATION OF AMERICA, CHEMICAL DIVISION, DEPT. 53-L

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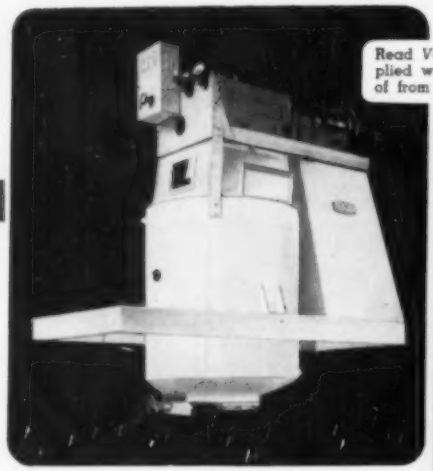
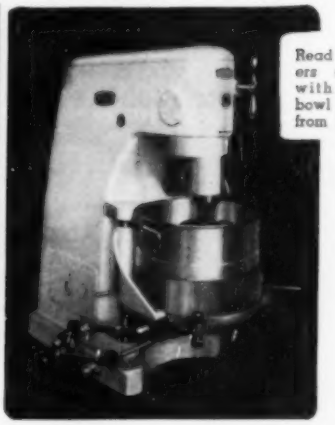
Read the Facts about READ Chemical Equipment



Read *Vertical Mixing Tanks* are supplied with stationary bowl capacities of from 100 to 1,000 gallons.



Read *Vertical Mixers* are supplied with removable bowl capacities of from 12 to 400 qts.

PLANETARY ACTION

. . . means thorough mixing without "dead spots" or "columns" of unmixed material

READ Vertical Mixing System Advantages:

- Read Vertical Mixing Tanks and Vertical Mixers are both *planetary action* machines, providing *controlled* stirring or mixing action through the whole batch—not violent action in a small area—thus a *thorough* mix without "dead spots" or building up columns of unmixed material.
- Beater revolves in planetary motion. Single, multiple or variable speeds.
- Vertical Mixers particularly advantageous in processing of dry materials, creams, emulsions, and light plastic masses. Vertical Mixing Tanks for larger, heavier batches. Latter have liquid-tight discharge gate in bottom of tank.
- Units may be supplied with *stainless steel* bowls and beaters.
- Vertical Mixers will accommodate several sizes of removable bowls; thus one machine can be used for large and small batches by changing bowls and beaters; water jackets, bowl scrapers, splash hoods, and fume hoods available, spring lock holds beater to driving head—thus no thumb screws or wing nuts.
- Vertical Mixing Tanks available with various types of mountings and arrangements for admitting materials for processing, and high-pressure jackets.

BRING YOUR MIXING PROBLEMS TO READ

MAKERS OF READCO CHEMICAL EQUIPMENT

WHAT'S YOUR NEED?

CALL ON. . .

READ MACHINERY DIVISION

of THE STANDARD STOKER COMPANY, INC.
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Write for literature on Read *Vertical Mixing Tanks* and *Vertical Mixers*.

ORONITE CHEMICAL COMPANY

THE NAME TO WATCH IN CHEMICALS

USE ORONITE POLYBUTENES FOR TACKINESS..HIGH DIELECTRIC STRENGTH..MOISTURE RESISTANCE

Adhesives, electrical insulation, sealing compounds, insecticides, leather and many other products can be greatly improved with Oronite Polybutenes.

Because of its inherent tackiness, this extremely useful product offers adhesive formulators, close control of "quick grab," "legs," and removal characteristics. High dielectric strength, low power factor, stability, moisture resistance and flexibility are a few additional advantages of Oronite Polybutenes.

Here also, is an excellent bodying agent. Eight grades of viscosity are available to meet specialized conditions. They can be compounded with a wide range of resins, oils, waxes, elastomers and adhesives. Investigate this important product today. Call or write the Oronite office nearest you.

In formulating adhesives, Oronite Polybutenes offer a wide range of variation in control of initial tack, strength, softness, removal characteristics and hot melt viscosity. They are adaptable in all types of mechanical application of adhesive composition onto backings whether it be by hot melt, solvent or emulsion. This versatile chemical product offers new possibilities in formulations requiring tackiness, pliability, moisture resistance, bodying or high dielectric strength.

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"SAVES 2000 LBS. STEAM PER HOUR"

with Taylor Compressor Control

One of the largest refineries in the country reports that Taylor automatic compressor control with Speed Transmitter has saved them as much as 2000 lbs. steam per hour per compressor in the past year. It can do much the same for you.

Like all other process industries, for many years this refinery held compressor speeds within certain limits by manually adjusted governors—regardless of changes in process conditions.

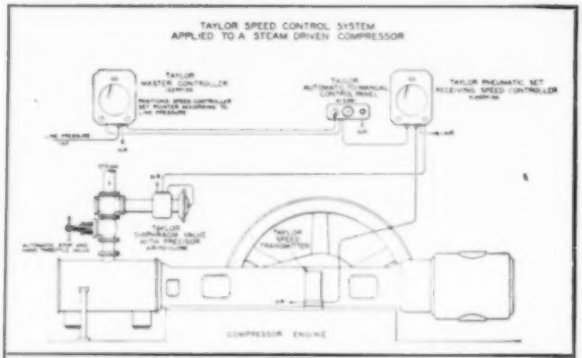
Now in the face of today's more rigid processing requirements, Taylor Compressor Control Systems combined with Speed Transmitters give you fully automatic control of compressors with direct relation to other variables in your process. These new compressor control systems were developed by Taylor Engineers working hand in hand for years with leading compressor manufacturers.

This all adds up to one important point. **When a compressor's function is closely controlled according to process requirements, substantial economies result from reduced fuel consumption as well as higher yields of quality end product.**

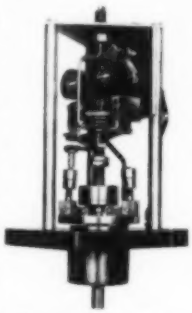
We can furnish a rugged, dependable control system for any type of drive. Ask your Taylor Field Engineer! Or write Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada.

• • •

Instruments for indicating, recording and controlling temperature, pressure, humidity, flow and liquid level.


TAYLOR SPEED CONTROL SYSTEM
APPLIED TO A STEAM DRIVEN COMPRESSOR
TAYLOR MASTER CONTROLLER
TAYLOR AUTOMATIC-MANUAL CONTROL PANEL
TAYLOR PNEUMATIC SET RECEIVING SPEED CONTROLLER
TAYLOR SPEED TRANSMITTER
COMPRESSOR ENGINE

HERE'S HOW THE SPEED TRANSMITTER WORKS



Briefly, it's a dependable pneumatic force-balance instrument. Principal parts: drive shaft, rotating table, flyweights and pneumatic force-balance assembly. The full range of engine speed causes but slight change in the radial position of flyweights to effect full output air pressure change. Since radius is essentially constant, centrifugal force of flyweights increases as the square of the speed. Consequently the air pressure to the force-balance bellows and the receiver Speed Controller must vary as the square of the speed. Drawing above shows how Speed Transmitter teams up with Taylor Pressure Controller, Pneumatic Set Speed Controller and diaphragm control motor to maintain constant discharge pressure from a compressor on a process.

TAYLOR INSTRUMENTS MEAN ACCURACY FIRST

DEPENDABLE POWER

BARRETT-CRAVENS
POWER-OX LIFT TRUCK

BARRETT-CRAVENS
POWER-OX LIFT TRUCK

Battery Electric Trucks and
EXIDE-IRONCLAD BATTERIES
CUT COSTS ALL ALONG THE LINE

With battery electric trucks in your plant, materials will move faster, smoother, safer, easier . . . and at a BIG saving—often as much as 50% or more. When powered by Exide-Ironclad Batteries, you can count on full shift availability with minimum power and replacement costs.

The EXCLUSIVE positive plate makes Exide-Ironclad Batteries DIFFERENT

They differ not only in construction, but also in performance and length of service life. Exide-Ironclad Batteries have ALL FOUR of the essential characteristics that a storage battery must have to assure maximum performance from battery electric trucks—high power ability, high electrical efficiency, ruggedness and a long life with minimum maintenance. The combination of these four Exide-Ironclad characteristics assures years of day-in, day-out service with dependability and economy.

Write for further particulars and FREE copy of Exide-Ironclad Topics, which contains latest developments in materials handling and shows actual case histories.

1888...DEPENDABLE BATTERIES FOR 61 YEARS...1949

"Exide-Ironclad" *Reg. Trade-mark U. S. Pat. Of.*

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32 • *Exide Batteries of Canada, Limited, Toronto*

NOW A compact desk-

For Wall or Panel Mounting

A Nationwide Distribution Through Electrical Wholesalers

... by CROUSE-

Locations in which the surrounding atmospheres contain sufficient quantities of flammable vapors, gases, or highly combustible dusts to create explosive mixtures are designated as hazardous by the National Electrical Code. Crouse-Hinds Explosion-Proof and Dust-Tight ET Series Telephones were especially designed for service in such hazardous locations.

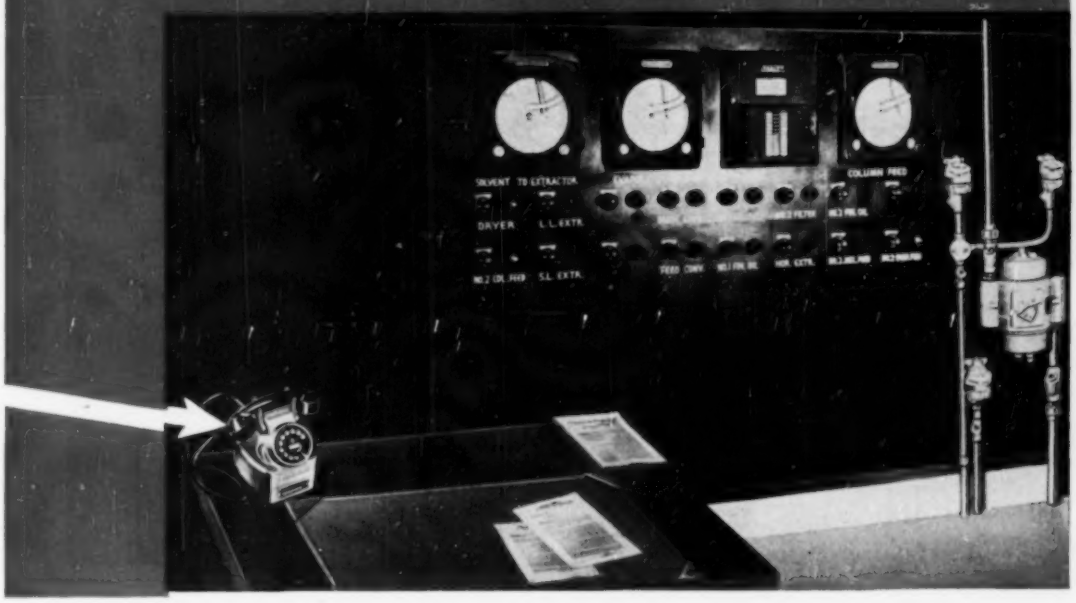
These explosion-proof telephones are made in four types:
Type ETDA desk telephone, automatic.
Type ETDM desk telephone, manual.
Type ETWA for wall or panel mounting, automatic.
Type ETWM for wall or panel mounting, manual.

All types are built to the high standard of Crouse-Hinds quality; carefully manufactured from the finest materials by highly skilled craftsmen. The cast aluminum housing is engineered to combine maximum strength with light weight, small size, and attractive stream-lining. There is a flame-tight joint between the two sections of the housing. The sections are held together by extra strong heat treated steel socket-head cap screws. A built-in bell is mounted in the base.

The handset on all types is explosion-proof and its 5-foot cord is attached to the housing with a factory-sealed connector.

CONDULETS • TRAFFIC SIGNALS

-type *Explosion-Proof* telephone



-HINDS

The desk telephone has rubber feet to protect the surface on which it rests.

The wall telephone is designed for mounting with the dial up and is equipped with a steel mounting plate. The base is reversible so the conduit hub can be at the top or at the bottom. The base also has a hub on the back for use if the conduit enters from the rear.

Both the desk and wall telephones should be connected to the Type ETS Line Switch, which can be mounted at any convenient location near the telephone.

In noisy locations where the built-in bell would be inadequate, separate loud ringing bells or horn signals can be installed.

Complete listings of explosion-proof telephones and accessories are in Crouse-Hinds Condulet Catalog.

Type ETH
High Power
Horn Signal
Double Projector

Type ETS
Line Switch

Type ETF
Extension Telephone
with Line Switch

Type ETR
Loud Ringing
Bell Signal

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Traylor Rotary Kilns

ALL NECESSARY switches and gauges . . . kiln speed regulator . . . heat and atmosphere controls . . . are centralized at one convenient location on a Traylor Kiln. Every phase of high temperature thermo-processing is continuously under the operator's observation and control.

The central control station of a Traylor Rotary Kiln is a feature as important as the exactness of its design and assembly—rigid, all-welded steel shell—cut steel driving gear—floating-type riding rings—improved supports and individual planning and construction.

Write today for full details of Traylor Rotary Kilns.

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ROTARY KILNS · COOLERS · DRYERS
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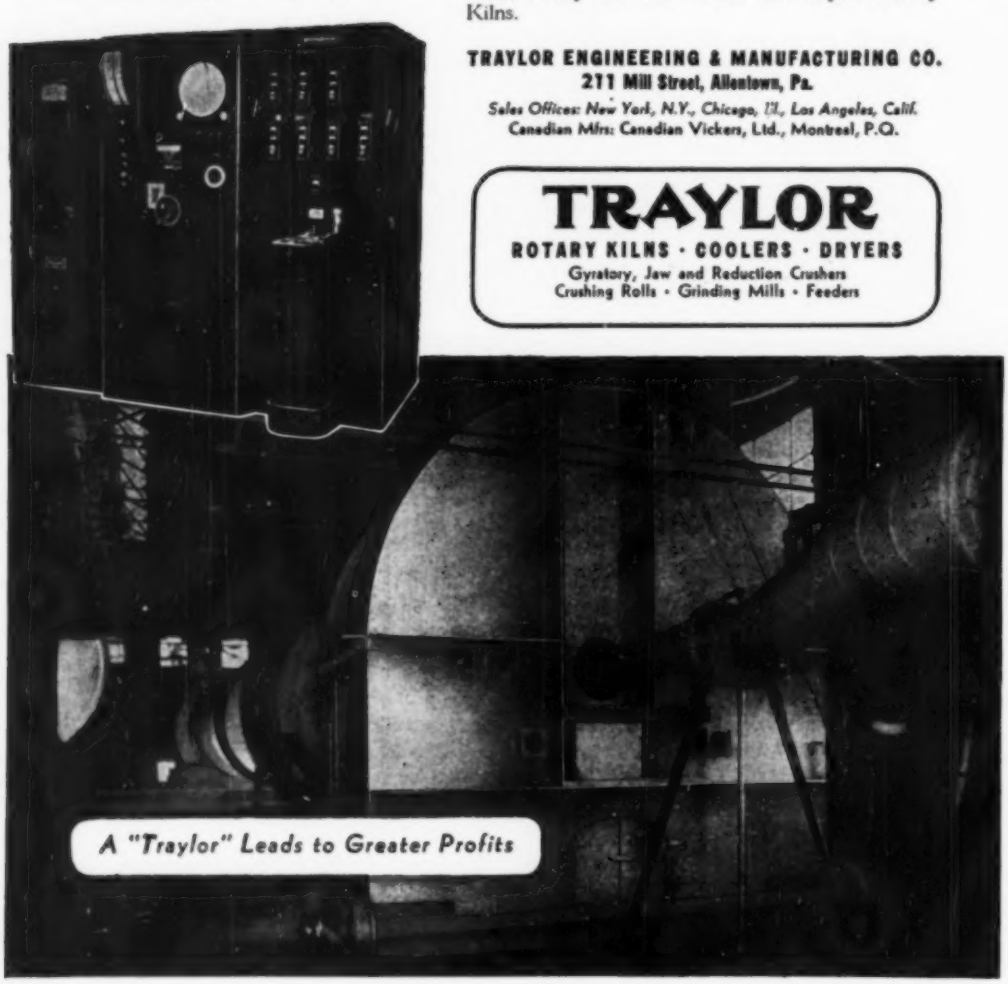

VESSEL DIVISION

NEWS

75th ANNIVERSARY 1871 - 1946

A.O.Smith
CORPORATION

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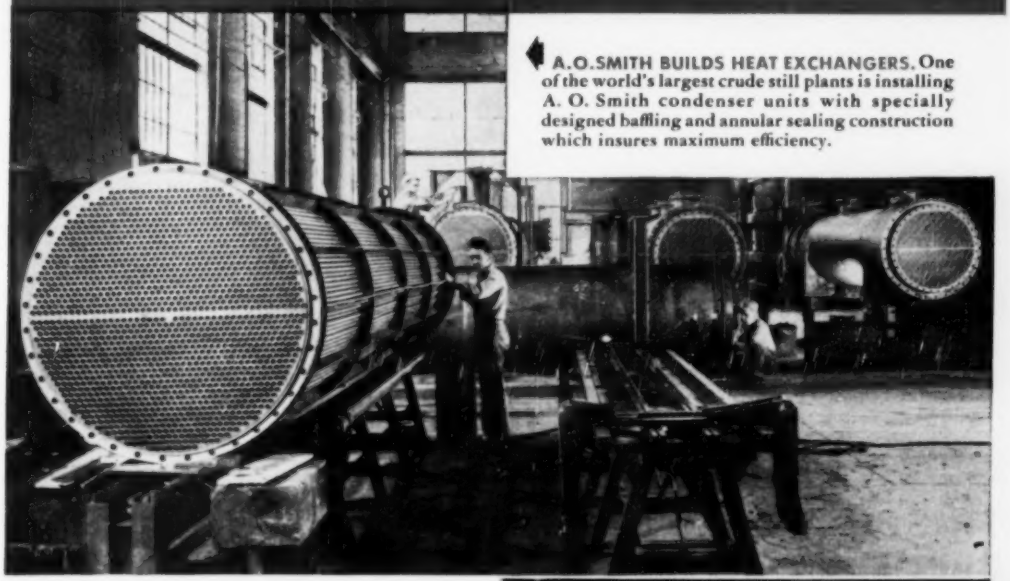
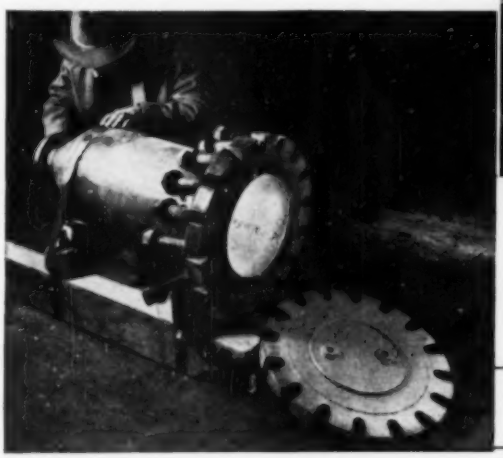


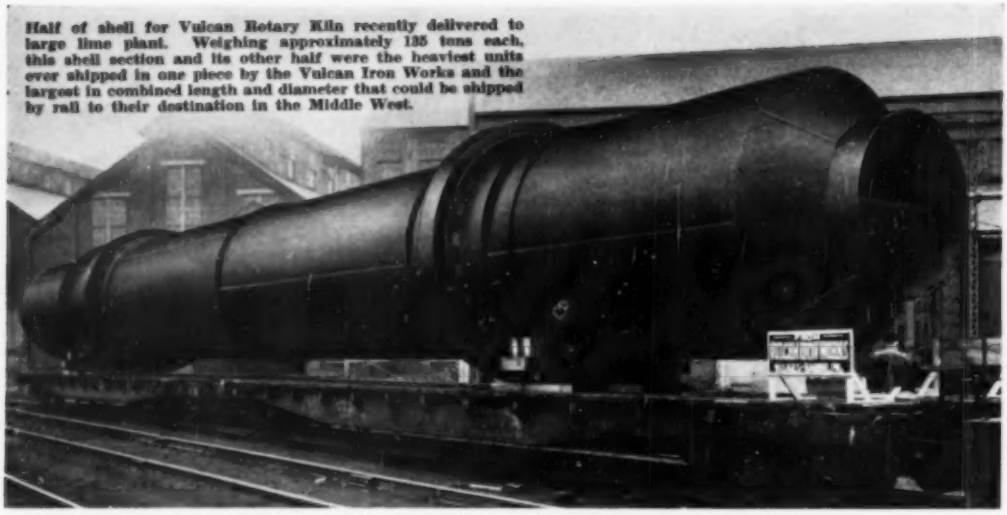
A.O.SMITH BUILDS HEAT EXCHANGERS. One of the world's largest crude still plants is installing A. O. Smith condenser units with specially designed baffling and annular sealing construction which insures maximum efficiency.

NO PIG-IN-A-POKE HERE. The customer and A. O. Smith collaborated in the building of this SMITHway alloy-lined experimental pilot unit so that the alloy lining, selected by laboratory tests for corrosion service, could be subjected to process test-runs before the full-size production units were manufactured.

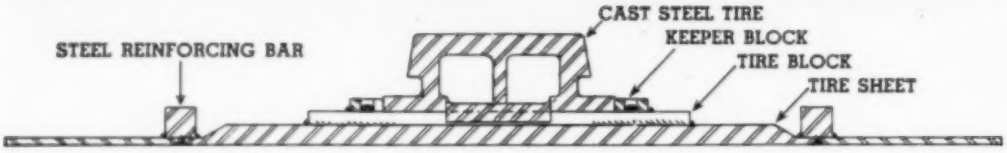


SAFEGUARDING THE CUSTOMER'S INVESTMENT. After the selection of the alloy lining, A. O. Smith makes doubly sure that it conforms to specifications, and does not contain any undesirable residual elements, by spectro-chemically analyzing sample coupons of the lining before releasing it for manufacture into the vessel.

VESSEL BULLETINS. Write the nearest A. O. Smith office listed above for Bulletin V-46, SMITHway Vessels, Alloy, Alloy-Lined, Clad, and Glass-Lined; Bulletin V-44, Field Assembly of Pressure Vessels.



Half of shell for Vulcan Rotary Kiln recently delivered to large lime plant. Weighing approximately 135 tons each, this shell section and its other half were the heaviest units ever shipped in one piece by the Vulcan Iron Works and the largest in combined length and diameter that could be shipped by rail to their destination in the Middle West.



THIS PATENTED RIVETLESS TIRE MOUNTING Cuts Maintenance Costs on Vulcan Rotary Kilns

The longer a Vulcan Rotary Kiln is operated the greater the savings secured—because of its very low costs for maintenance and repairs. Fifty years of continuous experience in the design, manufacture and servicing of this type of equipment has taught our engineers where operating troubles are most apt to occur and how to prevent them.

A typical example of Vulcan Trouble-Preventing Kiln Construction is the patented rivetless tire mounting shown above. Not only does it completely eliminate the rivet-popping once considered inevitable but its distinctive combination of interlocking lugs and blocks absolutely prevents creeping of the tire in any direction.

Another important advantage is the use of ONE THICK PLATE beneath the tire, instead of several relatively thin plates, thereby improving heat-conductivity and overcoming the former tendency toward burning or bulging of the shell and reinforcing bands at these particular points.

Write us regarding any manufacturing or processing problems within the scope of the equipment listed below. No charge or obligation for estimates, constructive suggestions and preliminary designs.

VULCAN IRON WORKS

Established 1849

Main Office and Works **WILKES-BARRE, PA.,** New York Office 50 Church

Rotary Kilns, Coolers and Dryers	Toothed, Double-Roll Crushers	Heavy-Duty Electric Hoists	Steam Locomotives
Rotary Retorts, Calciners, Etc.	High-Speed Hammer-Type Pulverizers	Self-Contained Electric Hoists	Diesel and Gasoline Locomotives
Improved Vertical Lime Kilns	Ball, Rod and Tube Mills	Scraper-Loading Hoists	Diesel-Electric Locomotives
Automatic Quick-Lime Hydrators	Shaking-Chute and Chain Conveyors	Cast-Steel Sheaves and Gears	Electric Locomotives and Larrys

ASK STOKES

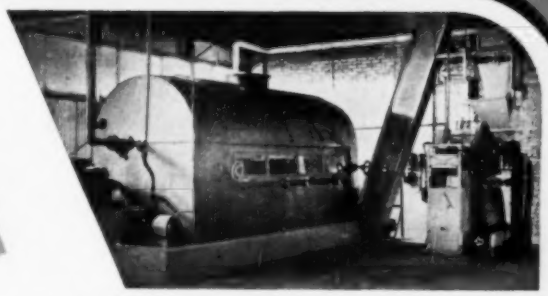
FLAKES, CHIPS, CRUMBS, CRYSTALS... Perfect Jobs for Stokes Flakers

GENERAL MILLS at Kankakee uses the Stokes Flaker for chilling and flaking saturated acids. As an integral production unit, the Stokes Flaker provides an efficient method for distributing cooling liquids . . . uniform, rapid cooling of the product is assured.

Stokes Flakers provide high speed chilling of flakes, chips, crumbs, crystals from hot, concentrated solutions or melted crystals. Magnesium chloride, phthalic anhydride, tri-sodium phosphate flakes; asphalt, pitch, waxes, stearic acid, and other products are now produced on Stokes Flakers.

The Stokes semi-plant-scale laboratory can tell you if your products are adapted to economical and profitable flaking operations. With Stokes' recommendations come precise production procedures and detailed operating costs per unit of production. Just send your raw products with statement of problems. There is no obligation.

This catalog describes Stokes Processing Equipment. It will be sent on request.



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Stokes makes Vacuum and Special Processing Equipment, High Vacuum Pumps and Gages, Pharmaceutical Equipment, Industrial Tabletting and Powder Metal Presses, Plastics Molding Presses, Water Stills and Special Machinery.

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HCl
$C_2H_4O_2$
C_6H_6
NH_4OH
C_6H_6
H_2S
$C_4H_3O.CH_2OH$
NH_3
HNO_3
NH_4OH
SO_2
C_6H_7N
$H_4P_2O_6$
C_2H_4
H_2SO_4
$(NH_4)_2S$
$C_{14}H_{10}$
C_2H_4
S
C_3H_6O
$C_{14}H_{10}$
NH_4F
CH_3COOH
NH_4Cl
Non-Corrosive Cooling Towers
More Vital Than You May Think
Even if the water to be cooled contains no traces of any corrosive chemical, though it often does, the air near the tower may bear corrosive fumes, emanating from your plant or from another plant adjacent to yours. These fumes drawn through the tower and mixing with the falling water can have a destructive effect on fans and interior hardware of water cooling towers. That's why fan blades for large and medium size C. H. Wheeler towers are made of non-corrosive plastic; also why bolts, nuts and nails may be supplied in either brass, copper, or standard galvanized steel. Tests and long successful experience of users have proved these plastic fans are immune to the attack of dilute solutions or fumes of the chemical compounds indicated by these formulae, and many others. Of course, the interiors of all C. H. W. towers are made of redwood, obviously non-corrosive, and the casings are of redwood, asbestos cement board, masonry, brick or properly painted steel. . . . Plastic fans and C. H. Wheeler water cooling towers have numerous other superiorities, fully described in descriptive literature. Write for it.
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REPRESENTATIVES IN MOST PRINCIPAL CITIES
SINCE 1903
C.H. Wheeler
STEAM CONDENSERS • WATER COOLING TOWERS
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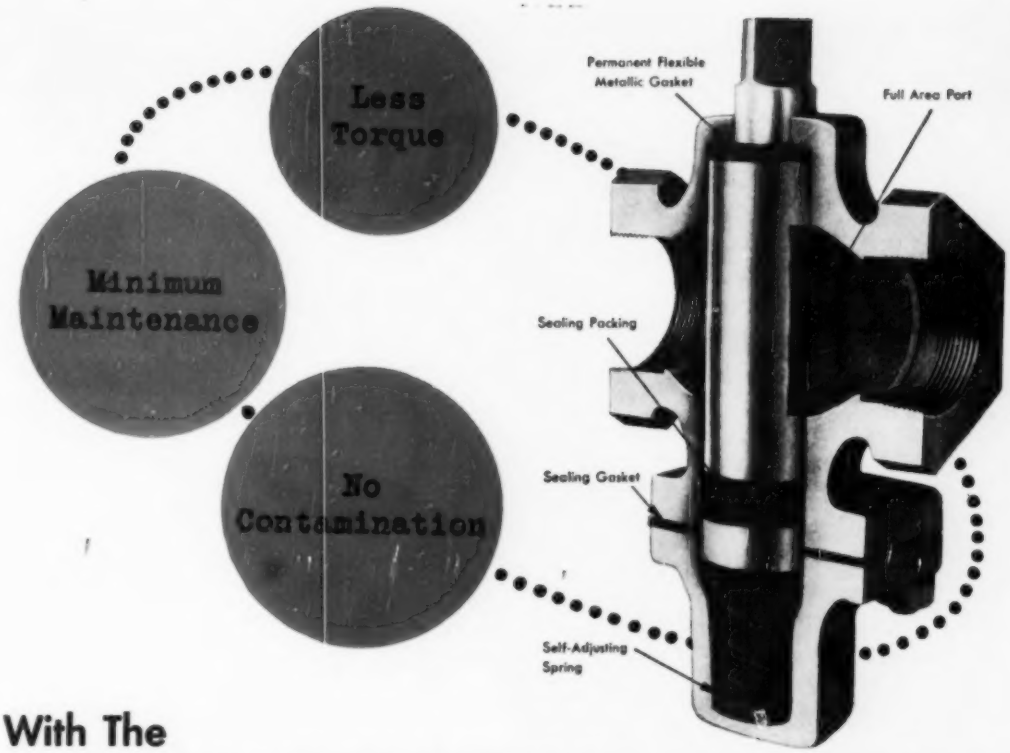
OF PHILADELPHIA



With The
BELFIELD CYLINDRICAL PLUG VALVE

Here's the only non-lubricated valve with a parallel side. The Belfield Cylindrical Plug Valve utilizes a flexible metallic gasket for permanent sealing . . . lubrication is not necessary . . . parallel sides reduce torque to ¼ of tapered plug valves.

The result! The easily turned stem never freezes . . . leakage is no problem . . . there are no lubricants to contaminate the flowing medium . . . and maintenance is practically nil!

In addition, the Belfield Cylindrical Plug Valve can be equipped with electric or air motor for remote control . . . and the port can be designed to provide specified flow characteristics.

Call in your local Honeywell engineer for complete information . . . or write for a copy of Specification Sheet 402!

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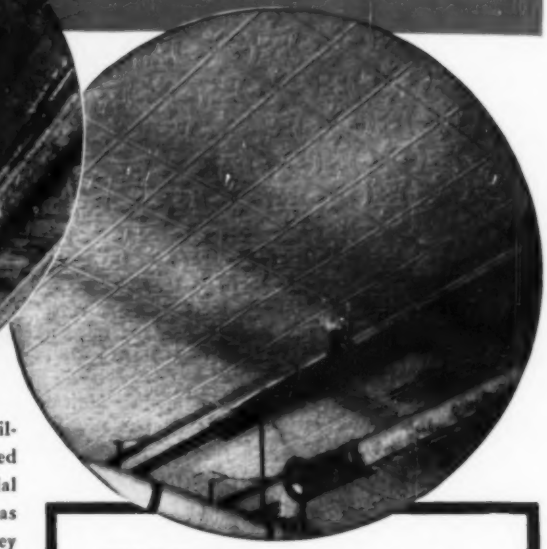
MINNEAPOLIS Honeywell — *Diaphragm Valves* AND PROCESS CONTROL SPECIALTIES — Belfield VALVES

Do you buy CORROSION PROTECTION BY THE GALLON? BY THE FOOT? OR BY THE YEAR?



THE photograph above shows two sections of a ceiling within 15′ of one another. The badly corroded area had been coated with one of the better industrial coatings. The one that looks as good as the day it was put on is coated with Tygon plastic Paint ... They both were exposed to the same conditions.

Frankly, you can buy "protective" coatings at a lower cost than Tygon; you can buy coatings that cover more feet per gallon. But you'll find it hard to buy real protection "by the year" at a cost anywhere near as low as you'll pay for Tygon protection.

For Tygon Paint doesn't chemically deteriorate with age; its tough, flexible, chemically-resistant film sets up a virtually impenetrable barrier against corrosion; stands up against the toughest conditions in your plant, month after month.

● *Write for a free test panel and the interesting new 16-page booklet "How to Use Tygon Paint for Longer Maintenance-Free Plant and Equipment Life."*

TYGON PAINT

Tygon Paint is pure Tygon plastic in a solvent vehicle; applied cold by spray gun or brush; air dries quickly to form a tough, flexible, impact-resistant plastic film; resists most acids, alkalies, oils, water, alcohols; available in white, black, gray, green, red, aluminum and clear.

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COMMENTS ON THE NEWS OF CHEMICAL ENGINEERING IN INDUSTRY

December 1949, Volume 56, Number 12

New wrinkle in potassium sulphate production

Potash Co. of America will build a new $1 million plant near Carlsbad, N. M. It will produce hydrochloric acid and potassium sulphate.

Grapevine has it that this plant will employ, not a Mannheim furnace, but a modification of the Hargreaves process. Best guess as to how the process will work: SO_2 will be passed through potassium chloride lying on perforated false bottoms in stacks within vertical chambers.

The Hargreaves method was patented in 1870 in England, where it was used extensively to produce sodium sulphate and hydrochloric acid until the high cost of hand labor knocked it out in the 1920's. One company in the U. S., Bay Chemical Co., successfully employs the Hargreaves process at its Weeks, La., plant at present to make salt cake and hydrochloric acid.

Potash Co. of America recently completed a $4 million expansion program to increase the output of 60 percent muriate, its major product. Work on the new plant is slated to get under way shortly.

Du Pont's Greenewalt on bigness

Big business has been getting a going-over in Washington hearings before Representative Celler's committee investigating monopolies. But last month the committee heard for the first time a vigorous defense and analysis of the economic basis for big business in the U. S. from one of the biggest of the big—Crawford H. Greenewalt, president of Du Pont.

In his statement, Greenewalt bore down hard on these points:

Concentration in U. S. industry is no greater than it was 20 years ago. Then, the 25 largest corporations had 26 percent of the corporate assets of the country; now the biggest 25 have 29 percent. "Both numerator and denominator of the fraction have become much larger, but the concentration is about the same."

Bigness, in the chemical industry, is not only a good thing; it is almost indispensable. Without being big, Du Pont could not have invested $43 million in research and plant in dyestuffs before returning a profit, or $27 million in nitrates, or $27 million in nylon.

Bigness is not the result of swallowing up small, weak competitors; it is a natural growth. In 1915 Du Pont had assets of $258 million; now they are about six times that amount. But only 12 percent of this growth came from acquisitions and only 18 percent from Du Pont's investment in General Motors stock. By far the largest factor—54 percent—came from "pulling ourselves up by our own chemical bootstraps."

There is no opportunity of any importance to be gained by splitting up the big outfits. An efficient sulphuric acid plant must produce 300 tons per day. If that were set by law as the maximum size of any sulphuric acid operation, today's 18 producers would become only 90.

In answering questions of the committee, Greenewalt stated that Du Pont's last acquisition of a company was in 1944. He indicated that the company now feels that it has a sufficiently varied production base to utilize commercially the developments of its research program.

He spoke out against the theory of oligopoly—domination of an industry by its "Big Three" or "Big Four." With laws already on the books to end restraints on competition, there can be no monopoly as long as there are two companies competing for business. Despite the fact that the steel industry is supposed to follow the leadership of U. S. Steel, Greenewalt noted, it was Bethlehem that broke ranks in the steel strike, eventually forcing U. S. Steel to come to terms with the union—or lose steel business to its smaller, but independent competitors.

When Congressman Celler read into the record 19 anti-trust cases that Du Pont had settled through consent decrees, *nolo contendere* pleas, or payment of fines, Greenewalt admitted that many of these cases were settled in this fashion rather than spend management time and large sums for legal talent in fighting cases up through the courts—which, he thought, in general, should be done.

Throughout his testimony, Greenewalt emphasized his opinion that the final arbiter of a company's size—or its success or failure—is the consumer. It is the consumer's vote—not that of Congress—that makes the decision on how big a company should be.

U. S. bears down on Russia

LID ON EXPORTS—Recent clamp-down on export of strategic commodities and of technical ideas is more than just an attempt to bring the so-called

(*Continued* on page 70)

New Reports from Users

Showing Typical Results on Corrosion-Control Problems where *Carpenter* STAINLESS No. 20 is used

Corrodent PRIMARY CONSTITUENT	REMARKS	PROCESS	RATING
Aluminum sulfate plus alumina	245°F.	Mfg. of aluminum sulfate.	Excellent, no sign of pitting after 35 working days.
Concentrated chlorine solution	— —	— —	Type 304 pitted. No. 20 satisfactory.
Fluoborate Plating Solutions	— —	Electroplating copper, zinc, etc.	Recommended for use in any of the commercial fluoborate plating solutions.
Maleic acid	30% concentration	— —	Excellent (better than Type 316).
Phosphoric acid	70% phosphoric 5% sulfuric some hydrofluoric boiling acid at 135°C.	— —	Excellent. Corrosion rate obtained: .0180 IPY.
Sulfuric acid	15/50% H_2SO_4 at room temperature	Nozzle for filling storage batteries.	Excellent.
Sulfuric acid	2 to 3% H_2SO_4 room temperature to boiling	Pickling tank.	Under severe working conditions Carpenter Stainless No. 20 showed no appreciable loss of weight due to corrosion (.00012 IPY).
Sulfuric acid	93% H_2SO_4 saturated with sulfur dioxide	— —	Excellent. Negligible corrosion rate (.00006 IPY).
Sulfuric acid	1% to 105% H_2SO_4	Dye manufacturing. Heat exchanger coils.	Approx. 8 times as resistant as lead. Expected equipment life 4 years with Stainless No. 20.
Sulfuric acid	10% solution 140/160°F.	Acid dip pickling process.	Excellent.
Wet Chlorine Gas	— —	— —	Not recommended.
Zinc Phosphate	Solution contained approx. 5% sodium chloride at 180°F.	— —	Estimated life 10 to 30 times that of Type 302 or 304. Total exposure during test: 460 hours.

THIS TECHNICAL BULLETIN *describing Carpenter Stainless No. 20 and its properties is yours for the asking. For your copy, just drop us a note on your company letterhead.*

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The STANDARDAIRE *Axial Flow* BLOWER . . . . .

Makes RPM=CFM . . . a performance typical of our No. 5 positive displacement blower — suitable for capacities of 800 to 2200 CFM at speeds of 800 to 2200 RPM operating at differential pressures of 2 to 20 p.s.i. The Standardaire No. 5 Blower offers this flexibility of operation plus the desirable characteristics of extremely low noise level and high efficiencies. To insure long service life under continuous operation these features have been built into the modern design Standardaire Blower: accurately generated, screw type rotors . . . shaved helical gears . . . precision, oversize, anti-friction bearings . . . oil pump with filter and strainer . . . three-point mounting. For further details write the Standard Stoker Company, Inc., Dept. A-12, 370 Lexington Ave. New York 17: N. Y.

A UNIQUE PULLEY ATTACHMENT . . .

The Standardaire No. 5 Blower will deliver a cubic foot of absolutely clean air for each revolution of its main rotor. Although direct drive from a motor ordinarily meets requirements, at such times when direct drive cannot be used a novel type pulley may be applied and a wide range of speeds gained. Each speed will give a definite air output to meet exacting demands. Contrary to the usual practice, the pulley is not mounted directly on the blower shaft. It is carried on an extra, built-in bearing which, in turn, is supported within a hollow bracket flange mounted on the blower. The pulley is driven through an internal gear type coupling—its bearing receives positive lubrication automatically from the main oiling system. This modern design drive pulley eliminates all cumbersome outboard bearings and jackshafts — another feature contributing to the remarkable flexibility of the Standardaire Positive Displacement Blower.

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positive export list up to date at year's end. It stems from a basic change in the thinking of Washington officials that will affect the chemical export business more and more as months go by. Chemicals and chemical production know-how are high on the list of things the U. S. wants to keep out of the Soviet.

NEW RESPECT—The idea that Russia's war-production industries are technologically backward and incapable of all-out production has been junked. Instead, there is a new respect for Soviet abilities, especially in the aviation and chemical fields, where concentration of effort and resources has been heaviest. Real proof of postwar Russian technological abilities came with President Truman's announcement that Russia has an atom bomb.

COUNTERMEASURES—So, immediately, the government took two steps to make sure that the Russians get no more from the U. S. than we want them to get.

First, export control lists were reshuffled to require licenses on critical industrial products and manufacturing equipment shipped anywhere in the world, instead of just to Europe. Commerce Department hopes this way to control re-exports with final destinations in countries behind the Iron Curtain.

Second, the government won agreement from U. S. technical and engineering societies to a voluntary program aimed at keeping technical information away from foreigners who might relay it to the Russians.

CHEMICALS—Commodities on the positive list that were shifted from European to world control include these chemicals: certain coal-tar intermediates; plastics and resin materials; synthetic gums and resins; non-petroleum anti-knock compounds; liquid gum inhibitors for treating petroleum distillates; certain alcohols; and other organics not of coal-tar origin, such as glycol compounds and hexamethylenetetramine. All told, there are 34 new classifications.

EQUIPMENT TOO—Also included are 31 classes of chemical process equipment. Some examples: compressors, oxidation equipment, hydrogen-producing equipment, autoclaves and digesters, nitrators, all high-pressure (over 500 psi.) processing equipment, and centrifugal countercurrent solvent-extractors.

Finally, global control has been imposed on 14 more general types of scientific instruments.

UP-DATING—Actually, there was some year-end up-dating of the positive list. A number of commodities were dropped from control altogether. These, however, are goods the Russians can make themselves or get elsewhere, but which immediately after the war were in short supply in the U. S. Many chemicals are included, but virtually no chemical engineering equipment.

Brakes on dismantling

The three big western powers have agreed to put the brakes on the dismantling of German steel, synthetic oil and rubber plants. These concessions result from decisions reached by the U. S., French and British Foreign Ministers at their Paris conference.

However, the occupying powers are standing firm on the continued razing of German plants devoted exclusively during the war to the making of war materials. Such plants go for reparations.

The slowdown in dismantling of steel and synthetic oil and rubber plants will be ordered while further negotiations are in progress.

Plants partly spared for the time being include the August Thyssen steel works at Duisburg-Hamborn in the Ruhr, said to be the largest steel mill in Europe. They also include the Borsig machinery plant in Berlin's French sector and the Charlottenhuette and Heinrichshuette steel plants, the Gelsenberg Benzin A.G. synthetic oil plant in Gelsenkirchen and the Chemische Werke-Huels synthetic rubber plant, all in the British zone.

In return, Western Germany is ready to enter fully into the Ruhr authority, give close cooperation to the allied security board, and allow foreign investments in German industrial enterprises.

Trio of contact plants for Pakistan

Biggest of the three sulphuric acid plants going up in Pakistan, a 20-ton contact process plant, is being supplied, not by Chemical Construction Corp., but by Nicolay Titlestad Corp. Contract calls for Titlestad to design the plant, ship materials of construction to Pakistan and supervise construction, which is now getting under way (see *Chementator*, Sept. 1949, p. 72).

However, Chemical Construction is supplying a 10-ton contact process plant for Pakistan. In addition, Chemical Construction has provided designs for the other 10-ton contact plant, to be furnished by Power-Gas Corp., Ltd., a British firm.

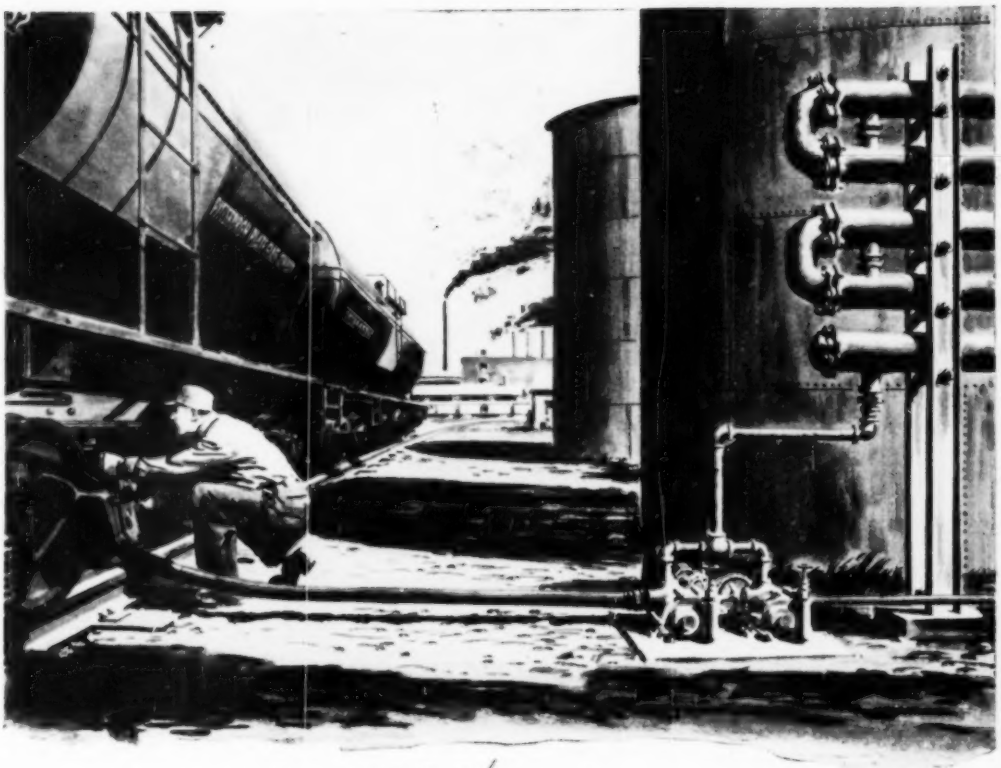
The three new plants are expected to be completed during 1950. They will raise Pakistan's total to six, and the 40 tons of added capacity will boost her rated output of sulphuric acid to 82 tons a day. This should make Pakistan self-sufficient in sulphuric acid.

Boost in minimum wage

What new minimum wage will Secretary of Labor Tobin fix for work on government contracts of $10,000 or more in chemical manufacturing? Current minimum is 40 c. an hr. in 11 southern states and 50 c. elsewhere.

At the Labor Department hearing last month the chemical industry—through the Manufacturing Chemists Association—proposed minima of 85 c. and 95 c. an hr.

(*Continued on page 72*)



73% vs. 50%

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increased freight rates require an up-to-date analysis of your delivered costs—basis NaOH

Many volume users of Caustic Soda are finding it advantageous to purchase 73% rather than 50% liquor. Substantial savings are thus realized through the greater Caustic content per car.

A patented Columbia process incorporates unloading and diluting in a single operation, in many cases permits present storage facilities to be used without alteration. You may find it profitable to use 73% Caustic. It's worth checking into. Write Pittsburgh Plate Glass Company, Columbia Chemical Division, Dept. CS-1, Fifth at Bellefield, Pittsburgh 13, Pennsylvania.

ARE YOU INTERESTED IN MORE FACTS? Your copy of the Columbia Caustic Soda Manual contains more detailed information on the use of 73% vs. 50% liquor. Additional data and recommendations are available from Columbia's Technical Service Department. Your inquiries are invited. Write to Dept. CS-1.

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District 50 of the United Mine Workers suggested one minimum for the whole country—$1.28 an hr. This, the UMW said, is the average minimum job rate prevailing for its 56,275 members in the chemical industry.

A survey by the Bureau of Labor Statistics showed that the average wage paid chemical workers was $1.51 an hr. in April. On a regional basis, however, the average was as low as $1.20 in the South and as high as $1.62 in the Southwest.

You can figure on the minimum going up to at least $1, possibly higher.

Headaches for unions in Southwest

Gulf Coast unions are having their troubles. Mathieson Chemical Corp. has advised officials of the striking Local 227 of the Oil Workers International Union, CIO, that it no longer considers the parent union or its local the bargaining agent for workers at its Pasadena, Tex., fertilizer plant.

In a letter to the local, signed by A. T. Bennett, vice president and general manager, it is pointed out that the fertilizer plant is now "fully staffed and manned" and that Mathieson has reason to believe that neither the OWIU nor its local now represents "a majority of our present employees." The letter was written in reply to one requesting a meeting to negotiate a new contract.

Elsewhere, a national representative of the CIO Gas, Coke & Chemical Workers reports rebel national officers and officials of Local 179 at the Celotex plant in Marrero, La., near New Orleans, have been repudiated by the local membership. A new slate of officers has been elected to take over affairs of the union (see *Chementator*, Nov. 1949, p. 70).

To Texas, two entrepreneurs

Kaiser and Frazer have come to Houston. Big question at the moment is how much will they invest there. Joseph Frazer, vice chairman of the board of Kaiser-Frazer, first to come to Houston, announced that he would build a plant there to turn city garbage into a chemical fertilizer.

In the footsteps of his partner, Henry J. Kaiser came to the Gulf Coast city. He looked over the Houston industries, took a boat trip down the Ship Channel, then got into an airplane and flew over the south Texas coastal area.

After taking an estimate of the Texas situation, Kaiser admitted that he is toying with the idea of building an aluminum plant in the state. In his opinion, Texas has the three essential requirements for an aluminum plant: raw materials, power and demand. If business conditions turn out to be as bright as he expects, his company "will have to build a plant here," Kaiser told Texans.

For Arkansas, a $20 million pulp mill

Prescott, Ark., is reported to be the site of a $20 million pulp and paper products mill. Money will be put up by three Arkansas lumber companies that will operate the mill.

To insure a sustained yield of timber, these companies have taken an option on a 10,000-acre pine forest. The mill will utilize low-grade pine timber.

What is more, it will provide a market for by-products from lumbering operations in that locality.

Two Texas companies on the block

Up for sale is Valley Vitamins, Inc., of McAllen, Tex. Meantime it continues its production of chlorophyll, carotene and xanthophyll from alfalfa. This plant was built by Godfrey L. Cabot, Inc., of Boston, in 1944.

This action comes in the wake of a similar step taken by Universal Colloids. Its big plant near McAllen still awaits a buyer. Under ownership of Sardik Foods Co., of New York, the Universal Colloids plant products from lumbering operations is that locality.

Newcomer in cellophane

After a year-long search Du Pont has at last found a taker on its offer to set up a competitor in the cellophane business. Olin Industries, Inc., is going into cellophane production, under a Du Pont contract.

Du Pont will grant Olin licenses on all its cellophane patents. Du Pont will also pick out a site, design and build a plant with a capacity of 33 million pounds of cellophane a year. Moreover, it will provide technical know-how and help train Olin's personnel.

Olin is paying a fixed fee for the design and construction of the plant; it is also paying for the licenses and technical help. Olin has purchased the Pisgah Forest, N. C., plant of Ecusta Paper Corp. and will produce its first cellophane there.

Early this year, Du Pont offered to set up a competitor in the cellophane business (see *Chementator*, Feb. 1949, p. 78). But there was this hitch: Du Pont stipulated that any taker would have to put at least $20 million into the new venture. And, as Arlington Kunsman, manager of the cellophane division of Du Pont's rayon department, points out, not many companies have that much lying around idle.

Of the companies that nibbled, Freeport Sulphur soon lost interest. For a while it looked as though W. R. Grace & Co. would really bite (see *Chementator*, Sept. 1945, p. 67). But at the eleventh hour, the deal fell through. Grace wanted Du Pont to set an upper limit on how much capital it would have to shell out. And Grace wanted Du Pont to provide technical knowledge for at least five years. That left Olin Industries, which finally proved the answer.

(*Continued on page 74*)

As the white outline indicates, a standard unit of much greater frame size would be required to do the work of Speedaire.

SPEEDAIRE delivers, rain or shine

OPERATING outdoors in all kinds of weather, protected only by a piece of sheet iron, this Speedaire drives a reciprocating feeder that empties slate from the storage bin above it into dump cars.

Three compelling reasons led the Coal Company to install Speedaire instead of a conventional worm gear reducer: Speedaire weighed 30% less—it required 26% less headroom—it saved $50.50.

Speedaire is Cleveland's new fan-cooled worm-gear speed reducer. Because it is fan-cooled, Speedaire will do more work—will deliver up to *double the horsepower* of standard worm units of equal frame size, at usual motor speeds. It can be installed economically on many applications where other types have been used heretofore—giving you the advantages of a compact right-angle drive. Speedaire gives the same long, trouble-free service characteristic of all Clevelands.

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CLEVELAND
Worm Gear
Speed Reducers

Olin Industries, one of the biggest U. S. makers of cartridges, military small arms and sporting rifles, is a tightly run empire with a net worth estimated at upwards of $65 million. The two men who run it, President John M. Olin and Vice President Spencer T. Olin, his brother, keep most of the 2 million shares of unlisted common stock to themselves, their gross and profit a secret. Since 1908, Du Pont and Olin have each owned 49 percent of Equitable Powder Manufacturing Co., which in turn controls three small subsidiaries making blasting powder and dynamite. The present corporation, formed in December 1944, when Olin Corp. merged with Western Cartridge Co., embraces a dozen manufacturing divisions and affiliates, including Winchester Repeating Arms Co. Its headquarters are at East Alton, Ill., on the Mississippi bluffs north of St. Louis.

President John M. Olin sees the move into cellophane production as logical for his company, which already has wide experience in cellulose chemistry, in which it has done much research as a result of its explosives and chemical business. He expects the new cellophane plant to add some $15 million a year to the gross of Olin Industries.

Normally, Du Pont would have built its own new plant to lick the postwar cellophane shortage. But in December 1947 Department of Justice big guns raked Du Pont with an anti-trust broadside, charging the company with unlawfully monopolizing the cellophane industry. Du Pont denied the charges; the case comes up for trial next year. Meantime, the anti-trust action made it awkward for Du Pont to go ahead with its expansion of cellophane capacity. So it began frying other fish, with its offer to a would be competitor.

The Olin-Du Pont deal brings a third cellophane producer into the U. S. industrial picture. Right now, American Viscose is the only U. S. company besides Du Pont that makes it. Output of cellophane has earlier been estimated at 220 million pounds a year, with Du Pont making 75 percent and American Viscose the rest. But Viscose hopes its expansion at Fredericksburg, Va., will bring its output up to 45 percent of the new total. And Du Pont's President Crawford H. Greenewalt has prophesized that cellophane output by all producers in 1949 will approach 300 million pounds.

Butyl rubber reefs its sails

Butyl rubber is slated for a cutback in production. By January, output of butyl for inner tubes may be cut in half. Already, shutdown of one unit at the Baton Rouge, La., butyl rubber plant has been ordered. Cecil Morgan, vice president of Esso Standard, which has been operating the plant under government contract, says the action results from a general reduction in requirements for rubber.

What is happening is that butyl rubber tubes are lasting as long as or longer than tire casings. Their better retention of air also increases the casing life. With cold rubber for treads in prospect, a revolution is under way in replacement tire and tube business.

Replacement sales of tires and tubes for passenger autos have fallen off abruptly this year. It is estimated that requirements for tires will be down 10 to 12 percent from 1948. Most of this decline occurred in second-half 1949. Demand for tires for new cars, up 25 to 30 percent from last year, is temporarily offsetting loss of replacement business. But the over-all outlook is discouraging tire makers.

Even more bleak are the prospects for sales of replacement inner tubes. Early in the year, the decline in tube sales was not alarming. But now it is becoming a major problem.

In self defense, tire makers are thinking about discouraging the use of butyl tubes. This would strengthen the replacement business by shortening the lives of both tubes and casings. They might limit their attempts to demanding that no new cars be equipped with butyl inner tubes. It is highly improbable, however, that automobile builders or the public would stand for this. Moreover, it does not fit into the traditional American pattern for coping with technological advances.

Inevitably, progress in synthetic rubber technology, resulting from the war, will benefit the public, despite this temporary crisis caused by the advent of butyl rubber.

Magnesia pulping hits economic snags

To lick the stream pollution problem, one pulp mill, that of Weyerhaeuser at Longview, Wash., has been converted from a lime base to a magnesia-base sulphite process (see *Chementator*, Dec. 1948, p. 74). This took care of the pollution problem all right, but, up to now, recovery of chemicals has been something else again.

To pay its way, a magnesia mill must recover most of the costly chemicals used to reduce the wood to pulp. A pilot-plant operation carried on during the war indicated possible recovery of 90 to 95 percent of the magnesia and 80 percent of the sulphur.

Weyerhaeuser's new mill, unfortunately, has so far been unable to recover more than 75 percent of the magnesia and 65 percent of the sulphur. Yet the plant hit capacity production as far back as last July. And stepping up this recovery of chemicals is all important to the showdown economics of the process.

Meantime, other companies are waiting until Weyerhaeuser works all the bugs out of its Longview operation before they adopt magnesia-base pulping in their own mills. It is being considered for the proposed new mill of Ketchikan Pulp & Paper in Alaska (see *Chementator*, Nov. 1949, p. 67). —*End*

The Labor Union Monopoly Bites *ALL* Workers

What kind of government is it which:

. . . Prosecutes the Great Atlantic & Pacific Tea Company which it asserts handles about 6½% of the retail food distributing business as an illegal monopoly in restraint of trade, and

. . . Seeks to break up four big meat packing companies and make them into 14 companies, charging the four with being a monopoly in restraint of trade, but

. . . Makes no move whatsoever to apply the federal anti-trust laws to the exercise of virtually 100 percent monopoly control of labor in the coal industry, and the only slightly less complete monopoly control of labor in the steel industry?

The answer to that question is simple. It is class government of the most flagrant type, a government by which special privileges are dispensed without justice and to the great injury of all workers. It is the kind of government which will lead to the early sacking of the American enterprise system and the personal freedoms of workers.

In legal terms the explanation of this flagrant affront to good government is also simple. In 1932 labor union activities were given virtually complete exemption from the application of the federal anti-trust laws by passage of the Norris-LaGuardia Act.

continued on next page

When the Norris-LaGuardia Act was passed labor unions were relatively weak. Only about 16% of the nation's industrial workers were organized, only about 12% of the steel workers. About two-thirds of the coal miners were union members, but only half that number were paying dues. The country was in the depth of its worst depression. The unemployment of about one-fourth of the labor force made monopoly control by labor seem so remote as to be almost fanciful.

But after only seventeen years devoted to the promotion of labor union organization by the federal government, we have labor monopoly with us. In its power and scope it makes the alleged business monopolies being prosecuted under the federal anti-trust laws seem positively piddling. In its manners it makes the old-time business monopolists look like Lord Fauntleroys.

What is lacking, grievously lacking, is action by Congress; action to shape our federal anti-trust laws to take account of the labor monopoly that has become the dominant national force in our country today—a force that is leading to the loss of freedom of all workers.

Before labor monopoly is broken up, as it must be broken up if our economy is not to be permanently wrecked, other steps will no doubt be required. But one test more than any other will be the touchstone of the nation's determination to keep its economic and personal freedom. It is what it does to see that labor monopoly receives the same treatment under the federal anti-trust laws as any other kind of economic monopoly.

The purpose of the federal anti-trust laws is to break up monopoly and preserve fair competition in the United States. It is a fine purpose. The wisdom and fairness of its application in particular cases is often open to challenge. But in spite of bad administration every farsighted business man I know is a staunch defender of our national anti-trust policy.

At present, in the exemption of labor monopoly, we have a breach in that policy which, if not closed, will soon become fatal both to the policy and the enterprise system it is designed to foster and protect.

The main thing wrong today with Great Britain and indeed all Europe is that no effective anti-trust laws are in existence to protect the public from business and labor monopolies, to guarantee personal freedoms. No free economy in Europe or America can prosper as long as protected monopolies remain and flourish.

While your representatives in Congress are home with you talk to them about the special privileges now granted to labor union monopoly. You would serve your country well by finding out what they intend to do about it before it is too late.

President, McGraw-Hill Publishing Company, Inc.

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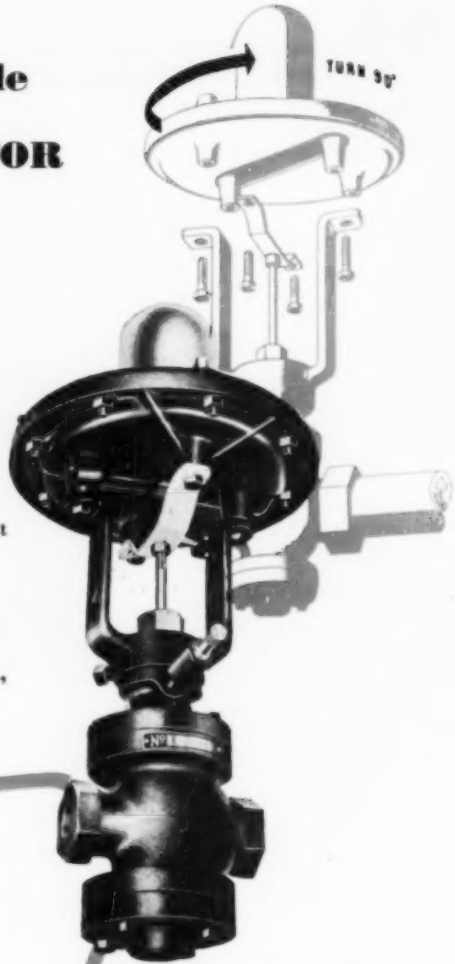
NEW! Quick-Reversible STABILFLO VALVE MOTOR

makes a 2-in-1 control valve



By a simple, ingenious application of relative-motion principles, Foxboro has developed a new valve motor to provide foolproof, almost instant reversibility of valve action. With it, valve action can be changed in four simple steps . . . unbolting diaphragm motor, rotating motor 90 degrees, rebolting motor and shifting air connections. That's all!

This new diaphragm motor brings you *convenience* never before available. It makes it possible to reduce valve *inventories*. And it permits you to standardize, throughout your plant, on the friction-free floating power that has helped make Foxboro Stabilflo Valves the standard of performance in all process industries.

Get all the facts about this new cost-saving development. Write for Bulletin on Quick-Reversible Stabilflo Valve Motor . . . the motor that now makes possible a 2-in-1 control valve. The Foxboro Company, 16 Neponset Ave., Foxboro, Mass., U. S. A.

Diagram A shows air-to-close action of a typical Foxboro valve body equipped with the new reversible motor. Yoke is rigidly attached to diaphragm motor housing and valve stem moves integrally with diaphragm plate. Air pressure is always on the same side of diaphragm whether on an air-to-close or air-to-open action.

Diagram B shows air-to-open action. Here motor has been turned 90 degrees. Now mounting lugs of diaphragm motor housing, originally bolted to yoke, are bolted to valve stem strap and lugs on diaphragm plate are bolted to yoke. Although diaphragm plate is rigidly attached to yoke, the diaphragm is free to move.

QUICK-REVERSING ON LINE. No need to remove, reverse and re-install valve

NO SPECIAL TOOLS NEEDED. Simple job . . . standard tools

NO MECHANICAL SKILL NEEDED. Valve action can be changed without services of a specialist

A DUAL-PURPOSE, QUALITY VALVE. Now, the widely-used Stabilflo Valve featuring 50-to-1 rangeability with uniform characteristics is available with this new cost-saving feature that makes it 2 valves in 1.

FOXBORO
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STABILFLO CONTROL VALVES

Let You Forget About Atmospheric Hazards

Shown here are four basic types of Century Protected Motors which are designed to resist the dangers of hazardous atmospheres. A properly selected Century motor—with the right protection—is the ideal combination for a long life of satisfactory performance.

1 **Open Protected** —Form J, general purpose motor—meets the needs for most installations where operating conditions are relatively clean and dry. The top half of the motor frame is closed to keep out falling solids or dripping liquids.

2 **Splash Proof Motor** —gives the necessary protection where plants must be washed down—keeps water out of the motor even when a hose is applied directly on the frame. It also provides protection against rain, snow, sleet and ice for outdoor installations.

3 **Totally Enclosed Fan Cooled Motor** — protects against dusts, mist or fog that might be detrimental to the vital parts of the motor. The inner frame protecting the motor is sealed to keep out harmful matter.

4 **Explosion Proof Motor** — protects against atmospheres charged with explosive dusts or gases. They carry Underwriters' label for specific kinds of hazards.

Century builds a complete line of alternating and direct current motors in a wide range of types and kinds—in sizes from 1/6 to 400 horsepower.

Specify Century motors for all your electric power needs.

Popular types of standard ratings are generally available from factory and branch office stocks.

-832

Century C MOTORS

CENTURY ELECTRIC COMPANY 1806 Pine Street • St. Louis 3, Missouri

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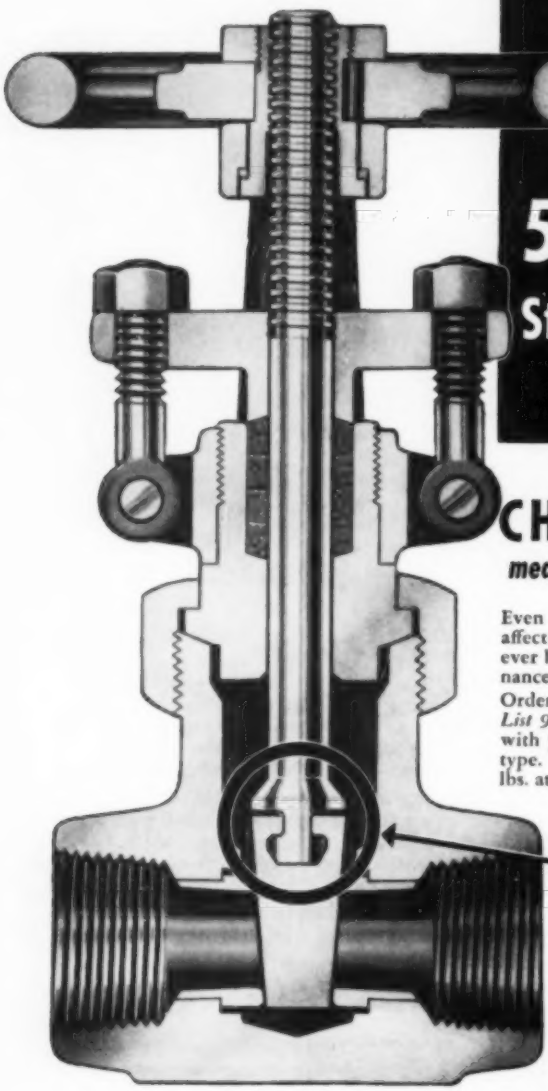
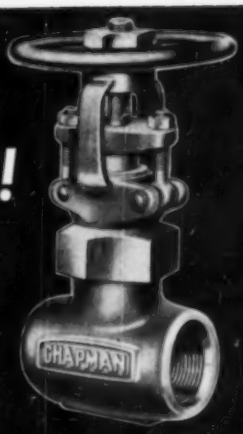




50% STRONGER
Stem and Wedge Gate Connection

OF
CHAPMAN LIST 960
means Lower Maintenance Costs for you

Even your most extreme operating conditions won't affect this newly designed List 960. It's tougher than ever before. Built to dramatically reduce your maintenance costs.

Order today so you can *check this extra-toughness of the List 960 for yourself.* Available ¼" to 2"... rising stem with yoke (as illustrated). Or rising stem inside screw type. For pressure range 2000 lbs. at 100 deg. F., 380 lbs. at 1000 deg. F. Specify List 990 for higher pressures.

NEW DESIGN...compensates at points where excessive strain can develop... gives 50% stronger stem and wedge gate connection

PLUS... extra wear resistance from heat-treated seat rings and wedge faces hardened to 800 Brinell by *exclusive* Malcomizing Process

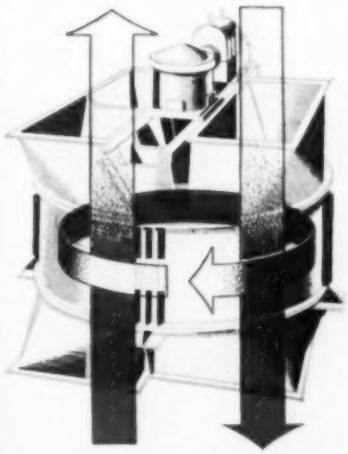
The Chapman Valve Mfg. Co., Indian Orchard, Massachusetts

Fact File on Preheat

No. 6

Cheaper grades of fuel can be used with the Ljungstrom air preheater. For in the Ljungstrom regenerative design heat does not pass through the metal. The elements therefore operate at a higher temperature . . . approximately a mean between the air and gas temperature. This permits safe operation at high recovery rates even with low grade or definitely corrosive fuels.

LJUNGSTROM



The Ljungstrom Air Preheater is a compact gas-to-air or gas-to-gas heat exchanger, operating on a continuous regenerative counterflow basis. Hundreds of leading power plants and other special applications confirm its high level of heat recovery and long-term low maintenance service.

THE

AIR PREHEATER CORPORATION

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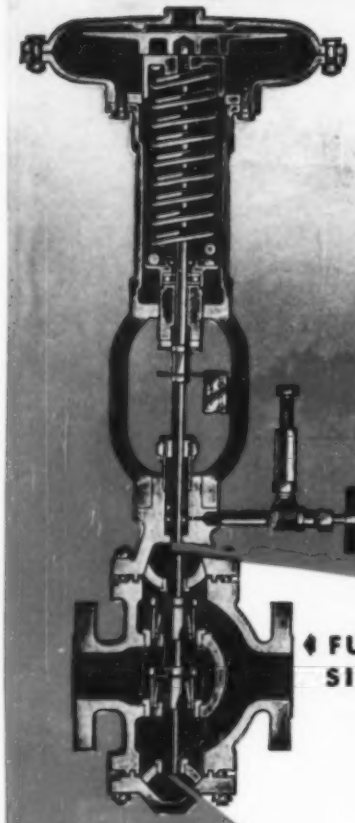
Plant: Wellsville, N. Y. 2879



RESTRICTED INNER VALVE PROCEDURE FOR FISHER DIAPHRAGM CONTROL VALVES . . . . . .

The introduction of Fisher's new restricted inner valves offers a quick, economical and completely satisfactory way to reduce the effective capacity of a larger nominal valve size.

INTERCHANGEABLE

◆ FULL SIZE

◆ 1 SIZE SMALLER

2 SIZES ◆ SMALLER

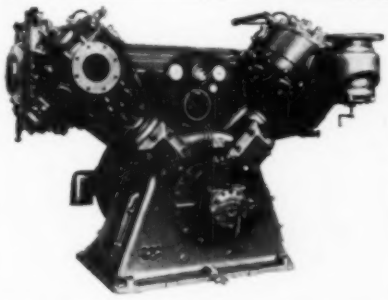
PRACTICAL

For example, a 4" valve can quickly be converted to flow capacity of a 3" 2½", or 2" size. This is accomplished by the restricted V-Port Inner Valve alone—without changing seat rings. Inner valves with equivalent smaller size valve area or capacity are fully interchangeable with standard full size inner valves. Inner valve skirts are cast stainless steel with wide range percentage characteristics port areas. Cast skirts are welded on to stainless steel bar stock center post guide. Further details and application data gladly furnished on request.

FISHER GOVERNOR COMPANY MARSHALLTOWN, IOWA

Here's a **RUGGED HEAVY-DUTY MACHINE** that supplies large air volumes with *GREATEST EFFICIENCY!*

JOY WN-114 AIR COMPRESSOR



The JOY WN-112 is a two-cylinder, heavy-duty, continuous type unit, having all the features of the WN-114. It delivers 368 to 1828 CFM, up to 3656 CFM in twin units.

Check these Features:

- Delivers 1092 to 3656 CFM, up to 7312 CFM in twin units
- Four Cylinders, two stage, double acting, water cooled
- Requires less room, costs less to install
- Exclusive Dual Cushion Valves are more efficient, have longer service life
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C-E Offers you

STEAM GENERATORS—FOR POWER AND PROCESS

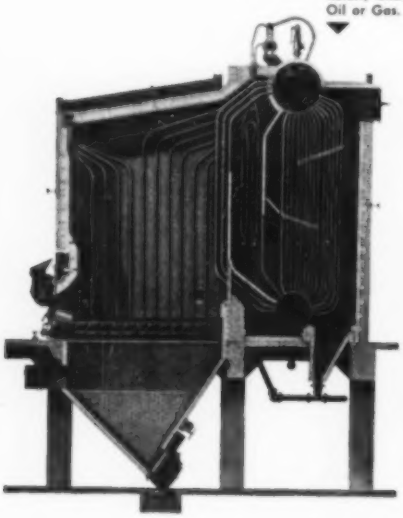
Day after day, in every part of the country, in every kind of chemical and process plant, the C-E Vertical-Unit Boiler, Type VU is proving itself an economical and dependable source of steam. At the present time, the aggregate capacity of these units installed in all branches of the process industries is well over 40,000,000 lb of steam per hr.

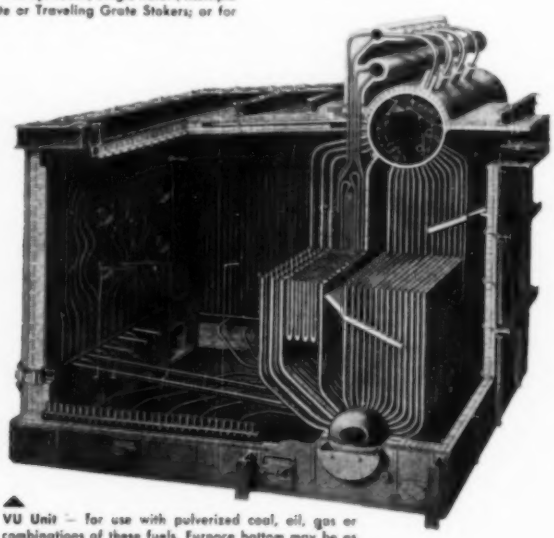
The reasons for the wide acceptance of this unit are simple enough. It is compact, efficient and reliable. It handles fluctuating steam demands quickly and easily. It performs well with all types of firing – pulverized coal, oil, gas or combinations of those fuels as well as with all types of stokers.

Furthermore the range of capacities is broad enough to serve the requirements of every type of process plant. Installations now in service vary in capacity from 10,000 to 350,000 lb of steam per hr, with pressures from 200 to 1000 psi and temperatures to 900 F.

As you would expect VU Boilers are operating under a wide variety of conditions. And they have made an enviable reputation for dependable performance regardless of the service required. Why not investigate the possibilities of a VU Unit for your plant the next time you are in the market for steam generating equipment.

VU Unit – for use with Spreader, Single Retort, Multiple Retort, Chain Grate or Traveling Grate Stokers; or for Oil or Gas.





VU Unit – for use with pulverized coal, oil, gas or combinations of these fuels. Furnace bottom may be as shown or of the hopper type.

COMBUSTION ENGINEERING

A MERGER OF COMBUSTION ENGINEERING COMPANY, INC. AND THE SUPERHEATER COMPANY

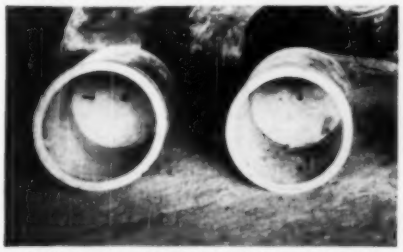
this Dual Service

PRESSURE VESSELS—TO YOUR SPECIFICATIONS

The fabrication of pressure vessels of various sizes and shapes necessitates manufacturing facilities and methods identical with those required for boiler manufacture. Combustion Engineering—Superheater is, therefore, exceptionally well qualified for such production, from small classes of work to the largest and heaviest pressure vessels employing any type of carbon, alloy or clad steel. Combustion's facilities for forming, machining, welding, X-raying, stress relieving and heat treating are unsurpassed.

In addition to these extensive manufacturing facilities, Combustion offers you years of experience in this highly specialized field — experience in actually producing thousands of these vessels, simple and complex—large and small. Whatever your pressure vessel requirements may be, you can depend on the facilities and experience of Combustion Engineering—Superheater to meet your needs. B-306

A group of air bottles, 16" O. D. x 54" long; made for 900 psi working pressure.



Small stainless steel jacketed vessels for use in chemical process work.

A cylindrical type digester for the paper industry; 10'-6" dia. x 40'-9½" overall length.

Nickel-clad steel processing vessel for the manufacture of plasticizing materials.

—SUPERHEATER, INC.

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Attention, Nordstrom Valve Users:

—THE miracle LUBRICANT

Automatic lubrication—a hit!

SAVES MAN-HOURS, SAVES LUBRICANT

The immediate and eager acceptance of Rockwell Hypermatic lubricant has been phenomenal. Now, more than 5,000,000 Nordstrom valves can be automatically lubricated by changing to Hypermatic. There's nothing to purchase but the lubricant. Impressive savings in man-hours will be made in servicing your Nordstrom valves because Hypermatic works while your maintenance men are absent. It automatically force-feeds and seals any voids which would cause leakage. It stays energized for prolonged periods.

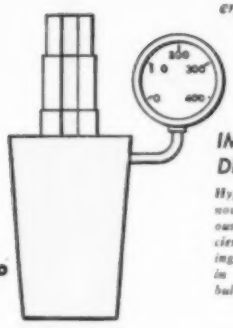
ROCKWELL **Hypermatic**

TRADE MARK PATENTS APPLIED FOR

LUBRICANT

GENUINELY AUTOMATIC

Hypermatic is automatic — not dependent upon pressure in the pipeline which can fail, or any mechanical contrivance. It stores its own energy.



KEEPS PRESSURIZED

SELF-POWERED FOR SEALING ACTION

IMMEDIATE DELIVERIES

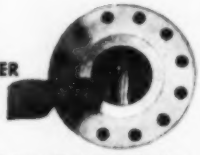
Hypermatic lubricant is now available in numerous grades and consistencies for temperatures ranging from —20F to +300F in stick form and soft bulk for gun injection.

THE 6 MONTHS TEST

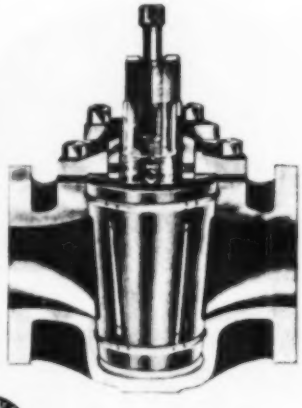
NON-AUTOMATIC Lubricated valve on line is pressurized to 350 psi, using a non-automatic lubricant. Pressure soon subsides.

HYPERMATIC Identical valve on same line, same pressure, using Hypermatic. After 6 months, pressure only slightly declined.

THE SCAVENGER TEST



Inject Hypermatic in any Nordstrom valve. Turn plug half open. Then scrape away all lubricant in plug's exposed vertical groove. Close valve for a few seconds. Then turn half open. Presto, —new lubricant has completely filled groove.



Gives Nordstrom valves greater efficiency, longer life

The reason there are over 5,000,000 Nordstrom valves in service is because they are the most dependable type of positive closure known to industry. Lubrication performs the triple function of lubricating the plug, sealing the ports and jacking the plug. Lubrication is the "making" of the valve. There's no substitute for lubricant. It's vital. Now, we have miraculously improved the lubricant by development of Hypermatic. Fundamentally, a valve is used to shut off a line. To do that, a valve must be in itself a perfect seal. Hypermatic keeps the valve sealed.

Nordstrom

LUBRICATED VALVES KEEP UPKEEP DOWN

ROCKWELL

Request Hypermatic Bulletin V-211

NORDSTROM VALVE DIVISION

Rockwell Manufacturing Co.

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PAYLOADERS make any job more pleasant for workmen . . . and more *profitable* for management. Clean jobs or messy jobs are all the same to a PAYLOADER. They're designed specifically to master all kinds of bulk material handling jobs found in the fertilizer and chemical industries, to move the largest quantities of mass materials at a time, to work fast in congested areas, to travel rapidly through narrow aisles, up and down ramps, over bare ground as well as floors and pavements. They dump their loads into containers, bins, hoppers, piles or trucks — high or low, slow or fast — by fingertip-controlled hydraulic power.

This HA PAYLOADER at Consolidated Chemical Company uses the fork type bucket shown to handle bones and leather scraps. A standard, 10½ cu. ft. bucket is used for granular materials. NOW this company actually receives all of its carloads of lime and sulphur in *bulk* rather than in bags because PAYLOADER has solved the unloading problem. A $75.00 bagging charge and 30 labor manhours are saved with *each* car!

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ESTABLISHED 1902 SIDNEY D. KIRKPATRICK, Editor

Chemical Engineering
WITH CHEMICAL & METALLURGICAL ENGINEERING

DECEMBER 1949

Contrasting Trends in Education

During recent visits to opposite corners of this country we have been amazed at the alarming extent that sectionalism is entering into higher education. One important state university restricts out-of-state job recruiters to interviews with only the lower half of the graduating classes. At another, the state employment service has complete charge of student placement. Thus those who hold the purse strings are attempting to dictate the careers of those who have been educated at state expense. That this short-sighted policy penalizes the taxpayers as well as the students seems to have escaped their attention.

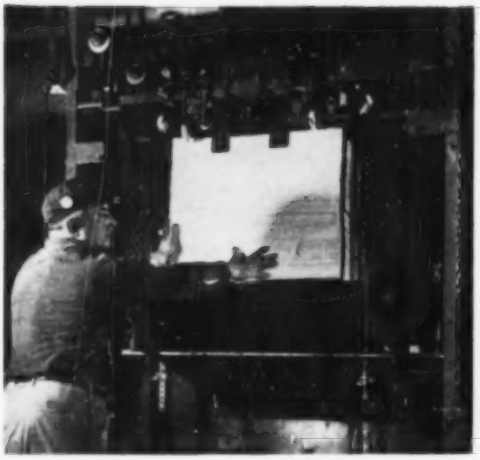
Their argument: "Why export our best brains? We need all the brilliant young men and women we can get to build up our industries and create new ones. And, after all, remember who paid for their education."

Among those who have vigorously opposed such narrow thinking is Dean Frank Hockema of Purdue. At the recent ECPD meeting in Chicago he said that Purdue graduates had always been encouraged to find employment wherever opportunities existed. Over the years they have helped to build up the national reputation of their institution. And, according to Dean Hockema, Purdue graduates have been responsible for bringing many new industries back to their native state. Thus he answers the selfish advocates of sectionalism.

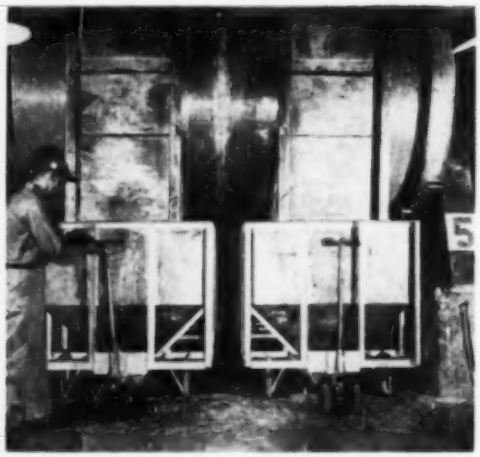
But we have also observed signs that there are other answers in the making. Next year almost fifty thousand engineering graduates are going to be looking for jobs. Judging from difficulties reported last summer by placement officers in several parts of the country, some of the 1950 boys will face frustration unless new doors are opened to them. Most opportunities, especially with the larger companies, appear in distribution and servicing of products. More technically trained men must be encouraged to find jobs with companies that now have no organized research and development departments. There is literally no limit to the field of the smaller entrepreneurs—those who bravely set up their own shops and businesses.

In contrast with the 1950 prospects there is every indication that an oversupply of new engineering graduates may be of relatively short duration. Enrollments have fallen off markedly in the lower classes. We are approaching a gap in the age groups of our population for there were fewer children born in the depression years of 1932 and 1933. The proportion of veterans in the entering classes is surprisingly low and G.I. funds no longer pay the bulk of the bills for books and tuition. Higher educational standards are beginning to have their effects in weeding out the misfits.

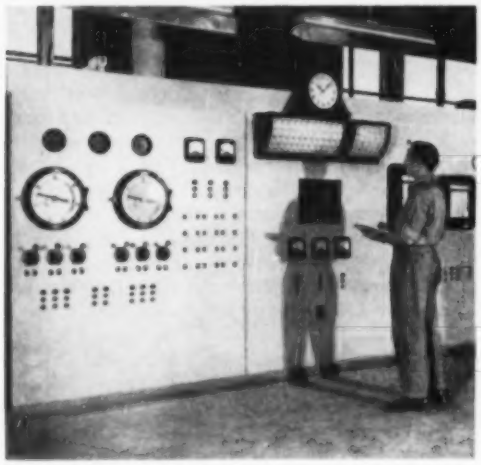
Thus there are many influences and trends that are certain to affect our educational institutions during the next few years. These are of vital concern to the engineering profession and to the industries in which its members find employment. Therefore all of us as individuals, or in corporate groups, should make ourselves heard in protesting policies that will limit opportunities for full cooperation between education and industry. Narrow sectionalism has no justification in this country. Nor do any employment policies that do not encourage the widest possible participation of engineers in all the phases and functions of American industry. We have too much at stake to settle for less than this.



UNIQUE EQUIPMENT in the molding powder plant includes this machine that feeds pulp into the knife cutter.



COST-CUTTING HANDLING, a Wallingford fetish, is here exemplified by dump hoods for discharging ball mill.



AUTOMATIC CONTROLS are feature of spray dryer plant. Draft gages show pressure in the dryer and the cyclones.

CONSTANT INSPECTION is vital. Absence of specks in molded piece indicates cleanliness of the molding powder.

Highlights in Production of Melamine and Urea Resins

American Cyanamid's resin plant solves a problem bothering many chemical process industries—how to gain the advantages of mass production and still keep process highly flexible.

JOSEPH A. O'CONNOR

Pictured flowsheet page 164. Photographs by S. E. Karson and B. W. Murray.

At its $9 million plant near Wallingford, Conn., American Cyanamid each day works a miracle of modern chemical engineering: it turns out a bewildering diversity of melamine and urea resins and molding powders, each tailor-made, yet on a mass-production basis. This is the biggest plant of its kind in the world. Yet, despite the volume of production, manufacturing processes are highly flexible. As a result, Cyanamid each year bites off the biggest chunk of a market that annually takes more than 85 million pounds of urea resins and over 15 million pounds of melamine resins.

First production came in 1941. Cyanamid initially spent almost $3 million to build the plant. Since January 1944 an expansion program has gobbled up over $6 million.

Wallingford's molding powder plant turns out melamine-formaldehyde and urea-formaldehyde thermosetting molding compounds. Expansion has tripled its capacity, which is now 2-2½ million pounds a month.

From the balance of the plant come: (1) laminating resins; (2) liquid and dry adhesives; (3) urea and melamine resins for treating paper and textiles; (4) resin intermediates for the treatment of leather; and (5) miscellaneous resins for ion exchange and other uses. Expansion has increased the capacity of the spray dryer plant to over 3 million pounds a month.

PLANNED EXPANDABILITY

How has this expansion job been done? The molding powder plant was designed so that flow of materials is in a U. Raw materials come in at one end, are processed as they travel around the U, then move out as finished goods at the other end. Thus, to increase capacity at any stage of the process, it was only necessary to insert additional units into this flow pattern. Expansion did not interrupt production.

Design of the spray dryer plant, on the other hand, allows for a second mirror-image production line to parallel the first. A complete new installation has been put in and is now operating. Design of the dryer plant gives maximum control over production in the added units with a minimum increase in supervisory, laboratory and operating personnel.

Flexibility keynotes Wallingford's processes. The diversity of resins coming from the spray dryer plant fails to slow its output. Or take the molding powder plant. This plant handles 30 to 40 different colors, often 10 or 11 at a time. Yet contamination is avoided. And no dirt gets into the powders to show up as specks in molded articles.

All this has not been easy. But Cyanamid engineers have met the challenge. Their ingenuity has produced simplified designs to make all equipment readily accessible for cleaning. In addition, there are the dust hoods and plenty of steam and hot water on tap. In licking dust and dirt, the air-conditioning set-up provides the Sunday punch.

Since flexibility is the goal, it is fortunate that the reactions of melamine and urea with formaldehyde are enough alike so that resins and molding powders from both chemicals can be made in the same equipment. But this, in turn, calls for operating controls designed to permit a wide range in process variables. And here again Cyanamid engineers have rung the bell.

Specialized auxiliary equipment abounds at Wallingford. In the molding powder plant, the device for breaking up the damp resin-impregnated filler from the mixer has been adapted from the mechanism used in the textile industry for removing linters from cotton. Molding powder from the Banburys passes through knife cutters designed to give minimum fines. Another feature is the system for controlling air flow and distribution in the spray dryers.

Nor have operating economies been overlooked. Costs are cut by bulk handling of liquids and use of palletizing and fork trucks to move packaged solids. Operating economies have more than offset climbing labor costs. So far, reports plant manager Philip B. Watson, each year has shown a net improvement.

When urea is condensed with formaldehyde, water-soluble mono- and dimethylol urea are the first products. Melamine reacts with formaldehyde to yield methylol melamine condensation products. In general, the melamine reaction is more difficult to handle.

During these reactions, temperature may range from room temperature to the boiling point of the medium. Ratio of urea or melamine to formaldehyde in different products may vary over a wide range. Hydrogen ion concentration is all important in the control of resin reactions.

After drying, these materials can be converted into insoluble products by heat and acid catalysts or by acid catalysts alone. Special alcohol-soluble resins can be made by completing the condensation of low-stage resins in the presence of aliphatic alcohols. Some of the available methylol groups react with the alcohol by ester interchange.

Melamine, urea, formaldehyde and sulphite pulp are the principal raw materials at Wallingford. At other plants Cyanamid makes its own melamine from dicyandiamide. Melamine and urea, in multiwall paper bags, arrive by boxcar. These bags are palletized and moved to storage by fork trucks. Also handled by truck are palletized 300-lb. bales of sulphite pulp. Formaldehyde comes either in tank wagons or tank cars. From the tank car unloading station, it is pumped to storage by two 100-gpm. stainless steel centrifugals.

Formaldehyde is stored in a unique 200,000-gal. concrete underground tank lined with a baked phenolic. In addition, a small brick building near the molding powder plant houses two 12,000-gal. formaldehyde tanks. These horizontal cylindrical tanks are made of rubber-lined steel. Near the spray dryer plant, an octagonal tile building houses another formaldehyde tank, a vertical cylindrical one that holds 60,000 gal. This steel tank has a baked phenolic lining.

From these storage points, formaldehyde goes to the processing plants. When pressure in the lines falls below 45 psi., the centrifugal pumps, activated by pressure switches, restore it.

Just what goes on in the big molding powder plant at Wallingford? Essentially, urea and melamine molding powders are made there by: (1) reacting urea or melamine with formaldehyde to form a liquid resin or sirup; (2) impregnating alpha-cellulose filler with liquid resin; and (3) heat-treating the damp mixture of resin and filler to drive out water and to condense the resin to a stage suitable for molding. In addition, the dried powder is ground, blended with modifiers, sifted, granulated if necessary to meet product specifications, cut or chopped, and packaged.

Sulphite pulp, source of alpha-cellulose for filler, is cut on the first floor of the molding powder plant and carried by an air stream to bins on the fourth and top floor. Stacks of pulp sheets are conveyed on skids to the knife cutters, and the fiber

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JOSEPH A. O'CONNOR, *our news editor, has had industry experience in resin production. That's why he was assigned the job of covering Cyanamid's Wallingford operations.*

conveyed pneumatically to cyclone collectors on the top floor. From the collectors it drops into cut pulp storage bins.

The two original cyclone collectors empty cut pulp into a storage bin or hopper with a capacity of 250 cu. ft. Another storage set-up now parallels the first. It comprises a second storage bin, larger than the original, with six cyclones emptying into it. These galvanized iron hoppers each have two horizontal finger agitators to prevent bridging of the pulp. Each hopper has a screw conveyor in its bottom.

FORMALDEHYDE ADDITION

Formaldehyde is pumped from storage through a positive displacement meter and into the kettle via a stainless line. Either urea or melamine, depending upon the kind of resin being made, is then dumped from bags into the kettle. Catalysts are added to control the condensation.

The stainless kettles are jacketed for steam heating. All have fume ducts and turbo-agitators. The operator controls the kettles from a central panel. Valves on the kettles, remotely controlled by extended stems, solenoids or air, are operated from this panel. Automatic recording potentiometers chart kettle temperatures.

During the time that the batch remains in the kettle a carefully controlled condensation occurs. Free formaldehyde, pH and color are checked constantly. Temperature is controlled. After condensation has been carried far enough, filter aids are added and the liquid amino-aldehyde resin circulated through a standard 24-in. steel plate-and-frame filter press to clarify it.

Next step is to impregnate the cellulosic filler with liquid resin. Use of the filler minimizes internal strains in the resin. Unmodified resins sometimes exhibit such strains due to changes in moisture content or possibly to changes in the chemical structure of the resin. There is some evidence of a bonding between the resin and the cellulosic filler. Whatever the mechanism, filled resins are much more resistant to changes in temperature and humidity.

How is the filler impregnated? First, liquid resin, either urea-formaldehyde or melamine-formaldehyde, is pumped in a stainless line through a positive displacement meter into a stainless steel mixer. Meantime, cut pulp from the storage hopper is fed by screw conveyor into a 90-cu.-ft. weigh tank. Filler comprises 30 or 40 percent of the final composition. From the weigh tank, the pulp goes into the mixer after the liquid resin. The sirup and pulp are mixed in double-arm open mixers, one for each of the continuous dryers. Fumes around the mixers are removed through a duct.

When resin and filler are mixed, the bowl of the mixer tilts to dump its contents into a car that travels up a skip hoist and empties into a screener. Here a specially adapted device breaks up the damp mixture of resin and filler. The screener can be rolled out of its housing for hosing down.

Sirup-impregnated pulp is conveyed from the screener into the oven dryer. The galvanized iron shells of the dryers are coated with acid-resistant paint. The continuous belt in each dryer is cadmium-plated.

Material is dried in thin layers under controlled temperature and humidity. The damp mixture entering the dryer contains about 50 percent moisture; material coming out contains only about 1 percent. Further condensation of the resin takes place during drying.

Dried material next goes through a cutter. Then a screw conveyor moves it to a chute through which it drops from the third floor, where the mixers and dryers are located, into a sheet metal hopper on the second floor. From this hopper, the material is discharged into fiber drums. These are stored under controlled conditions.

Grinding in ball mills is the next step in making molding powders. During grinding, the material is blended with modifiers. These include pigments, mold lubricants, and molding catalysts or curing agents. The latter are capable of developing acidity; their function is to reduce molding time. The blend is ground to a fine state to insure uniformity.

From unground storage, the containers are emptied into chutes to the ball mills. The chute hoppers are on the second floor; the ball mills, on the first.

Coming from the ball mills, 90 percent of the product is finer than 300 mesh and has an absolute density of 0.30 to 0.35.

Powder obtained from the ball-milling operation has a low density. Hence when this material is molded a reduction in volume occurs. For some uses, therefore, the powder must be densified. This is done by heating the material in a Banbury mixer. Partial fusion of the powder occurs, thus reducing the volume of the material.

Drums of powder to be densified are put on skids and taken up in a freight elevator to the second floor. There they go under a dust hood, and the ground material is weighed into charges for the Banbury mixers.

In these mixers, particles of the fine powder are squeezed closer together under heat and pressure. The breathing action gets out the air that makes up the surface film on the particles. As a result of granulating in the Banbury, the absolute density of the powder, which is 0.30 to 0.35 coming from the ball mill, is doubled to 0.60 or 0.65.

Temperature in the Banburys varies from 150 to 220 deg. F. Shell and rotors of each mixer are cored for circulation of hot water and steam.

The ram in the Banbury mixer operates hydraulically. Each mixer is controlled by a wattmeter showing power input. The meter indicates the rate of operation and provides a check on the operators. And it indicates when the powder charged to the mixer has been granulated.

Fines from the Banburys, together with fines from the rotary screeners and sifters, are reworked in the Banburys. These have hoods to trap dust.

Granulated molding powder drops through a hopper into a screw conveyor that feeds it into a scalper and cutter.

The powder then moves onto a conveyor cooled by 50 deg. F. water. More lubricant may be added to the material as it comes off the conveyor. Under a dust hood at the end of the vibratory cooling conveyor the material passes over a scavenger screen through which fines pass. Then the material is drummed. Finally, the 200-lb. and 225-lb. fiber drums are moved to finished product storage.

Finished molding powder is kept in cold storage at controlled conditions. Whether granulated or not, finished molding powder is known as Beetle if it contains urea resin and as Melmac if it contains melamine resin.

SPRAY DRYER PLANT

The other major unit at Wallingford is the spray dryer plant, where both liquid and spray-dried resins are made. Spray drying of resins is a tricky business. It involves the dehydration of a urea-formaldehyde or melamine-formaldehyde reaction product to produce a dry resin.

First, let us see how liquid resins are made. The process is straightforward. The glass-lined kettle in which liquid resins are made is jacketed, has an agitator and is equipped with a steam jet ejector that can pro-

vide about a 28-in. vacuum for concentrating.

After formaldehyde has been metered into this kettle, either urea or melamine is charged and the catalysts added. As the condensation progresses, temperature, pH and periods of reflux are carefully controlled. Each resin is processed to the customer's specifications. Total time in the kettle depends on the resin being made. Filter aids are added at the end of the reaction.

Finished liquid discharges from the bottom of the kettle. It passes through a filter screen and is drummed in 55-gal. steel drums.

Now let us take a look at how spray-dried resins are produced. The stainless steel kettles in which the resins are made are jacketed and equipped with turbo-agitators. Recorders chart kettle temperatures. The kettles are equipped with air-operated valves and are controlled from the instrument panel. All of the kettles have fume ducts.

Formaldehyde is run into the kettle, either urea or melamine charged and the catalysts added. Proportion of materials charged depends on the resin being made.

Feed of liquid resin or sirup to the spray dryer is automatically controlled through the amperage load on the spray motor. When the amperage gets too high, an ammeter, which controls the valves in the sirup feed line, causes the feed rate to the spray dryer to be reduced.

The spray machine revolves at 13,000 rpm. A hoist lifts it into and out of its position in the top of the spray dryer. Each of the two spray dryers has a Bowen No. 54 spray machine and atomizer.

Spray dryers and their furnaces are outside at one end of the building. While the new spray dryer is not lagged, the original one is lagged with asbestos and weatherproof cork.

Each spray dryer has a direct-fired furnace. Designed by Bowen, these furnaces each have a 950-cfm. turboblower for air. Two 10,000-gal. underground tanks hold a 15-day supply of fuel oil.

Liquid resin is sprayed into the chamber in fine droplets. Heat from the mixture of hot combustion gases and air evaporates the moisture in the resin droplets and dries them to a fine powder or dust. The combustion gases from the furnace enter the chamber at the top through a duct.

Still under the draft of the main fan, the gas stream conveys the dried resin dust out through a duct at the bottom of the spray chamber. Hot gases and resin dust pass over the cyclones which collect the powdered resin. In the new installation, two skimmers, which are smaller cyclones, catch any resin that gets by the larger collectors. Powdered resin collects in the bottoms of the vertical conical cyclones. The hot moist gases go out through an exhaust stack.

Resin dust in the cyclones is collected by a secondary air stream. This secondary air, traveling through a collecting manifold with a Venturi lock at each collector, picks up dust from the bottoms of the cyclones and conveys the dry powdered resin to a final collector. Air from the top of this final collector is recycled into the duct leading to the tops of the cyclones.

SPRAY DRYER CONTROLS

On the original spray dryer installation, manometers show the pressure in the throat of each cyclone collector. The new spray dryer installation has draft gages indicating the pressure in inches of water for each of the collectors. Draft gages also show air pressure in the spray dryer chamber, in the secondary air duct, in the skimmers and in the final collector. When clogging of particles causes pressure in a collector to rise, the draft gage automatically flashes a light and rings a warning bell.

Continuous recorders chart temperatures in the cyclones, which range from 200 to 150 deg. F. Cyclones are equipped with outlet heads, water jackets and hoppers at inlets and outlets. Temperature of product coming from the final collector is at a maximum of 95 deg. F.

From a liquid sprayed into the chamber, the resin is dried to the bone-dry powder that comes out.

Resin comes out the bottom of the final collector and goes through a Mikro-Pulverizer. Then it drops into ribbon blenders that also function as weigh tanks. From these the powder goes into larger water-jacketed ribbon blenders. Fillers are added to the powder in these blenders. Exit temperature from the blenders is 95 deg. F.

A screw conveyor takes the material leaving the blenders to the drumming and bagging station. Drumming is done into 225-lb. fiber containers. Bagging is done on a dustless bagger into 55-lb. multiwall paper bags. Finished product is warehoused.

In all, there are five production units at Wallingford: the molding powder plant, the spray dryer plant, the industrial molding compositions plant, the ion exchange resins plant and another unit not yet completed. During the war, Cyanamid was the sole producer of a melamine-formaldehyde molding compound for distributor heads in aircraft. Though expensive, it has exceptional arc resistance and resistance to corona discharge. The original pilot plant has been expanded into a unit that can turn out limited commercial quantities of Cyanamid's Ionac ion exchange resins. Meantime, new resins of greater ion exchange capacity are being investigated, and trial production runs are about to be made. A highly flexible unit, the ion exchange resins plant requires only two men on each shift to operate it.

Wallingford's air-conditioning system produces air at 80 to 82 deg. F. with a humidity of 30 percent. Return air goes through Roto-clones, then through filtered chambers with cloth bags and through oil screening that takes out super fines. Finally, it passes through the dehumidifying beds. About 15 percent fresh air is fed in at all times.

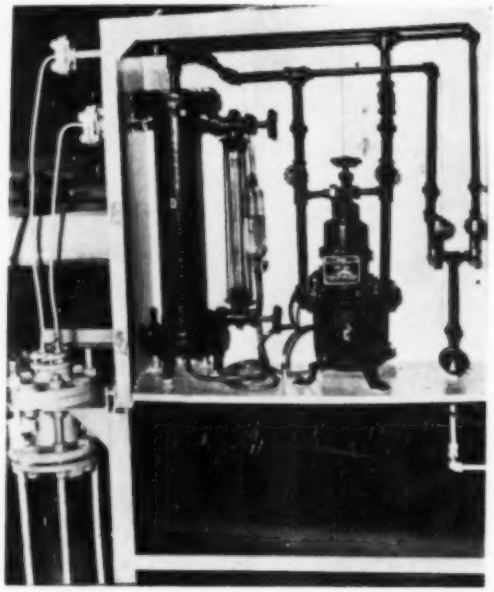
DUST BATTLE

Major safety problem is dust. Keeping dust out of resins and molding powders is also a production problem. Hoods, housings and suction help to overcome the dust hazard. On jobs that call for them, workers must wear goggles and respirators. Dust is water-soluble, hence cannot cause silicosis. But it can cause allergy in certain individuals. Formaldehyde dermatitis is another problem with a few individuals.

As a result of the expansion program, the working force has tripled. Wallingford employs over 500. The molding powder plant alone employs 130 to 140 men. There are about 275 production workers, excluding shipping, maintenance and control laboratory employees. There are about 80 maintenance workers. About 50 people are engaged in routine laboratory control work. Of the 24 members of the technical staff, three are chemical engineers. Normally, the plant runs seven days a week.

J. L. Rodgers, Jr., general manager of Cyanamid's plastics and resins division, foresees a stable demand for the plant's products continuing at a high level. As the use of plastic materials increases, he expects the out put at Wallingford to increase proportionately. And, as Rodgers points out, the plant has the acreage, as well as adequate power and water supplies, for further expansion. So Wallingford's mass-production miracles are slated to keep Cyanamid out in front in urea and melamine resins and molding powders.

Continuous Specific Gravity Measurement



SET-UP of the specific gravity measuring system. Parts may be identified by comparison with the diagram at the right.

Engineers of the Celanese Corp. of America have taken the air bubble method and

R. O. DENYES and C. L. FOX, JR.

Continuous and accurate measurement of specific gravity of viscose spinning bath has been developed at the Rome, Ga., plant of the Celanese Corp. of America. The system, adopted after considerable investigation of available measuring devices, is supplying a continuous chart record of viscose spin bath specific gravity between the limits of 1.2 to 1.4.

The primary measuring elements consist of two dip tubes through which a constant flow of air is purged into the liquid whose specific gravity is being measured. Air is supplied to the dip tubes at a constant rate as set by needle valves and indicated by rotameters in the air lines. Since this air flow rate is adjusted to be equal in each dip tube, any pressure differential existing between the two tubes is a function of two factors—the difference in the depths of immersion of the tubes, and the specific gravity of the liquid being measured.

Because the difference in the depths of immersion of the tubes is constant, any variation in the pressure differential is caused by changes in the specific gravity of the liquid.

Measurement of this pressure differential constitutes a reliable evaluation of the specific gravity of the liquid being measured. This measurement is accomplished primarily with a differential bell-type meter. A bell-type float, riding on a pool of mercury within the meter body, indicates the differential by virtue of its position, i.e. the height to which it rises, and this position is transmitted electrically to the recording instrument by means of an inductance bridge circuit. Pressure range is equivalent to 2.536 in. of water.

DR. DENYES *is group leader and* C. L. FOX *is senior chemist at the plant of the Celanese Corp. of America in Rome, Ga.*

HOW IT WORKS

The pressure difference across the two air lines will be X inches of water multiplied by the specific gravity of the solution. So the minimum difference will be 1.2X in this case and maximum will be 1.4X inches of water. So 1.4X minus 1.2X must equal 2.536 which is the range of the meter. Therefore X is 12.68 in.

But the meter must read zero when the pressure differential is 12.68 in. of 1.2 sp. gr. liquid. So the air to the shallow tube is first bubbled through a liquid of constant specific gravity (called a reference liquid). This, in effect, makes the two tubes at the same depth in the liquid where specific gravity is to be measured. The meter reads zero at 1.2 sp. gr. Changes in reading will be due solely to changes in specific gravity. And at 1.4 sp. gr. the meter will be at 2.536, its maximum.

Since two dip tubes are immersed in the liquid under test, variations in liquid level have an equal effect on each tube. For this reason, minor changes in level do not affect the accuracy of the instrument. If a single dip tube were employed, the distance would be measured from the submerged end of the dip tube to the level of the liquid. In this case, any variations of the liquid level would cause the measuring instrument to react as though changes in specific gravity were taking place.

A thermometer bulb is installed in the process vessel and connected to a second pen in the gravity recorder. The temperature record provides an accurate and convenient reference for calculating the specific gravity at a

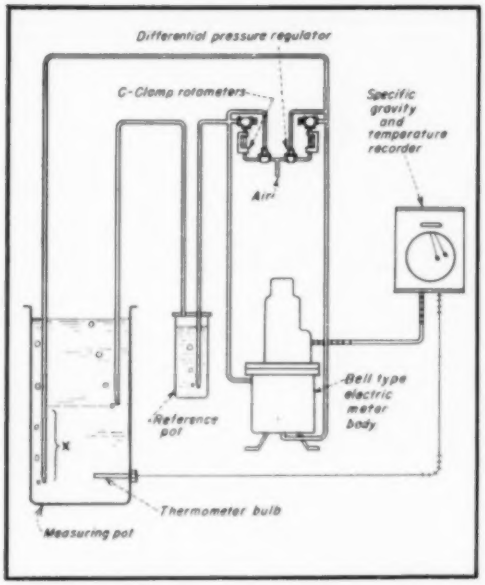
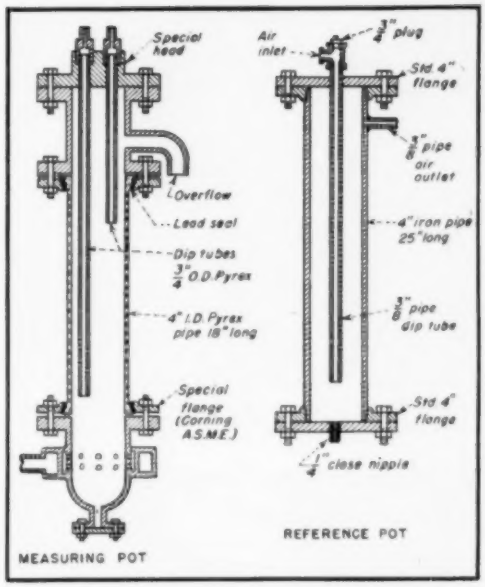


DIAGRAM of the device which is mounted at the spinning machine to record specific gravity of the viscose spin bath.



DETAILS of the two pots that form the heart of the recording system; see text for explanation of how and why they work.

successfully applied it to the continuous recording of viscose spin bath gravity

temperature other than that recorded, or for correcting the recorded value of specific gravity for any given temperature.

All components of the measuring system are mounted in cabinets which protect them from fumes and splashing liquid. Doors (which were removed for the photograph reproduced above) are kept locked to prevent unauthorized personnel from tampering with any adjustments.

The reference pot consists primarily of a length of pipe with a pair of standard flanges. The dip tube extends through the upper flange to within about 3 in. of the bottom flange which is tapped and supplied with a nipple. The plugged tee opening is used as a clean out port.

Flexible tubing and a leveling bulb (see cut), connected to the nipple in the bottom flange, facilitate maintenance of the correct level of reference liquid within the pot.

The measuring pot was specially designed by personnel of the Rome plant to withstand the corrosive action of the acid spin bath, and to permit the production of an exceptionally smooth chart record. The chamber proper consists of an 18-in. length of 4-in. I.D. Pyrex tubing. This tubing is sealed into head and bottom sections of lead by means of special Corning ASME flanges.

Two dip tubes of ¾-in. O.D. Pyrex gage glass extend into the glass measuring pot. The longer of these tubes is connected to the purge air supply line and to the high pressure side of the meter body. The other tube is connected to the air supply from the reference pot which, in turn, is connected to the purge air supply and the low pressure side of the meter body.

The specially designed plenum chamber in the bottom section of the measuring pot aids materially in obtaining an extremely smooth chart-record. It provides for a steady inflow of spin bath solution and eliminates the agitation or whirlpool effect that could result from admission of the solution through a single opening in the bottom section.

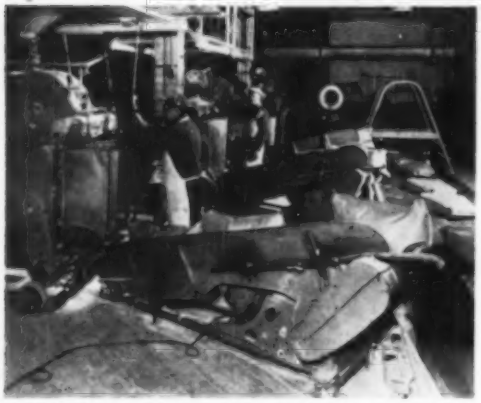
INSTALLATION

Experience of the personnel at the Celanese plant responsible for developing the measuring system proves that care and time taken in designing and installing measuring and reference pots and other components of the system are amply justified by highly satisfactory results.

Once the equipment is correctly installed and the flow of purge air to the dip tubes properly adjusted, there is little need for any other than routine instrument maintenance.

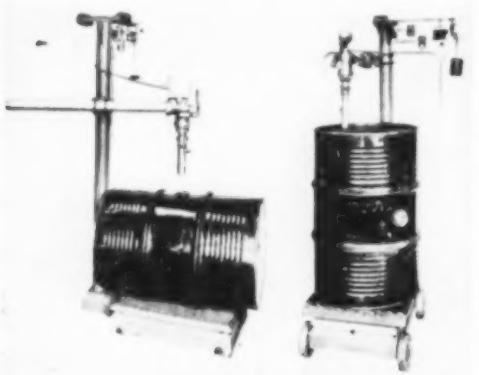
After the system had been in operation for some time, it was found that the small amount of spray thrown upon the inner walls of the dip tubes in the measuring pot, as the air bubbles alternately formed and broke, caused a solid crystalline deposit which, after about 10 days, changed the inner diameter of the glass tubes sufficiently to introduce an error into the instrument. This condition was easily overcome by shutting off the flow of purge air for about five minutes at regular intervals (approximately once a week). When this was done, the spin bath solution rose in the dip tubes and dissolved the precipitated solids.

The specific gravity recorder can also be utilized as an automatic controller. When equipped with an internally mounted pneumatic control unit, the instrument automatically adds makeup solution to the continuously recirculated spin bath whenever the measured specific gravity falls below the value established by the setting of the controller.



AUTOMATIC FILLING systems like this St. Regis bag-filling installation can speed packaging of large-volume operations.

AUTOMATIC PACKAGING is supplemented here with an Extendoveyor which can be adjusted to any desired length.



AUTOMATIC CUTOFF is provided in this liquid filling-weighing attachment. These Vol-U-Meter units speed filling.

Check Your Chances to

Cut Cost Of Packaging

Modern techniques of packaging can help reduce costs if you really put some effort into it.

R. W. LAHEY

Chemical producers can economize on packaging and shipping. However, savings are available only if a careful study and comprehensive investigation is made.

In most cost-cutting investigations all of the principal components of production costs have received careful scrutiny. In addition, costs of raw materials and marketing have all been gone over with a fine tooth comb.

It is safe to assume that cost of containers and the expense involved in packing products into containers have come in for their share of scrutiny. Packaging cost may be a minor part of the total but nevertheless it warrants a second "look see."

Have you outgrown hand filling?

Packing of dry products is usually a hand operation although there are many automatic and semi-automatic installations for filling open-mouth and valve-type bags. If volume of production warrants an expenditure in the range of $3-10 thousand, use of bag-filling machines can often effect savings which will amortize their cost in a comparatively short time. Valve-bag packers usually provide greater possibilities of savings because the expensive bag-closing operation of sewing or tying is eliminated. These machines are available in the impeller, belt, and auger types and they will pack dry materials having widely differing physical characteristics. Most of these packers weigh automatically—some are combined with automatic scales for pre-weighing while other gross weigh. One type has an automatic cutoff based on a time cycle which usually requires check-

R. W. LAHEY *is a consulting editor on packaging for* Chemical Engineering. *He is an expert on packaging problems and heads up American Cyanamid's packaging and materials handling department.*

weighing. Substitution of equipment of this type can often save as much as 50 percent of the packing labor used for hand filling.

Valve bags manufactured from kraft paper and textiles can be fabricated to provide product protection of the most exacting requirements. The valve-filling machine sets the type and size of the valve-opening in the bags. If the impeller packer is used a 3 or 3½-in. valve is adequate. The other types of packers require larger valve openings, usually 5½ in. The self-closing features of the smaller valves ordinarily prevent any significant amount of sifting of the product through this opening. The 5½-in. size, however, is so large that tuck-in sleeves are usually required. These sleeves which are pasted around the inner periphery of the valves, are folded, and tucked into the valve after the bag is filled. Another type known as "L.C." sleeves extend inwardly into the bag rather than outwardly. Not only are the L.C. sleeves cheaper but folding and tucking is not necessary. Thus packing rates are increased and packing labor costs reduced.

Automatic and semi-automatic open-mouth-bag filling and weighing machines offer possibilities for savings in packing costs. These machines essentially consist of an automatic scale attached to a storage hopper. After filling, bags are usually closed by sewing.

There are also possibilities for reducing the cost of packing liquid products into steel drums and other liquid tight containers. Use of automatic or semi-automatic equipment to replace hand filling operations will usually increase production and reduce packing labor costs. Automatic volumetric or weighing fillers can be installed at nominal cost. Automatic weighing machines consisting essentially of beam scales and electrically operated cutoff valves are efficient tools and can be operated to weigh well within industry tolerances. They are almost always more accurate than manual weighing operations.

Are you satisfied with standard machinery?

Most packaging investigations are limited in scope to consideration of existing packaging machinery and standard types of containers that are readily available. Most machinery which is used for packing bulk or commercial containers has never been developed to that stage of efficiency attained by manufacturers of packing equipment for small containers. Thus there are possibilities for reducing packing costs if improvements in the design of this equipment can be devised. Such improvements can often be worked out by assigning mechanical engineers to the project. Packing machinery manufacturers are not usually as well equipped to do this work. They do not have the intimate knowledge of the problem and often cannot afford to incur the expense because sale of the equipment is sometimes limited. Containers as well may often be made to fit a specific requirement by minor changes in construction. This is worth studying.

An agitated scale for dry-loading drums and barrels?

Most installations for packing dry materials into rigid containers such as drums and barrels consist of a storage hopper equipped with a hand operated gate. The container is either agitated during the filling operation or sits directly on a scale. There are disadvantages to both methods. If the container is agitated during the filling operation it must then be weighed and contents adjusted to the required amount. If the container is weighed as it is filled, then it is safe to assume that a container is being used that is larger than required to hold the contents when properly deaerated or settled. There is an urgent need for machinery which will pack, weigh, and at the same time deaerate. If such equipment were available substantial savings in packing cost could be obtained. The use of vacuum packing equipment can often accomplish these desired results.

Do you need a surge bin on your production line?

Often the compound is delivered to the package directly from the last manufacturing process. If it is a batch operation, production is delayed by the time that it takes to pack the batch. Even if the manufacturing process is continuous, production rates vary and this obviously prevents efficient packing. Installation of storage hoppers of sufficient capacity to provide even packing rates and to allow maximum use of production equipment will ordinarily produce savings in packing cost. Likewise, one-shift packing of production operations conducted on a 3 or 4 shift basis can effect large savings. Such savings are often large enough to justify the investment for storage hoppers and additional packing equipment. Storage in bulk is in most instances the most economical method because it eliminates the extra cost of handling and storage after packing. A surge bin may help you cut costs.

Which costs you more—manpower or horsepower?

The efficiency of filling operations for liquids and dry products can often be increased by the use of conveyors to move empty rigid containers to the filling heads and to remove filled packages. Belt conveyors are the accepted type for bags and boxes while roller conveyors are more efficient for rigid drums and barrels. Each installation should be specially designed to fit into the individual layout. It is usually more economical to label and stencil empty containers than filled ones. It should be done on the conveyor line, preferably a holding conveyor, just prior to filling. The use of electric hoists equipped with grabs to remove heavy filled rigid containers from conveyors is recommended. Not only does this reduce cost but it is safer and prevents damage to scales, etc. Automatic wrenches for tightening drum bungs may be used if production volume is large enough to warrant their use.

The use of fork-lift trucks and pallets for movement and storage of finished goods has been extended to carloading and has resulted in substantial savings. If this system is not used, roller and belt conveyors may provide some economies. Maximum efficiency is obtained if the containers can be delivered so that packages can be stacked in the freight car right from the conveyor. There are retractable belt conveyors which are designed for loading bags and boxes into box cars. Stacking of heavy rigid containers, which are often loaded two or three high, presents a more difficult problem. The use of certain types of barrel and drum grabs which are designed for use on fork-lift trucks can reduce cost of loading labor and increase the safety of this sometimes hazardous operation.

How much can you afford to give a-weigh?

It is well to assay the accuracy of weighing equipment. Limitations of accuracy in packing weights often result in overweight packages to be sure that no underweight containers leave the plant. As accuracy of weighing is increased the packing cost rises in proportion. Therefore the extra cost incurred to improve accuracy must be balanced against savings obtained. Little can be gained by reducing the overage by a fraction of a pound per container for a product that sells for one cent per pound if cost of packing labor is increased. This may not be true however, for compounds worth considerably more. Thus it

is difficult to establish a general rule for weighing tolerances. Factors affecting accuracy of weighing include speed of packing, maintenance of equipment, check-weighing, accuracy of operators, and tare weighing of containers. For instance, a 5 percent tolerance (plus or minus) is required for 18 gage 55 gal. steel drums because this tolerance is allowed on weights of steel sheets. Based on a theoretical weight of 50 lb. there is a total allowance from the acceptable minimum to the acceptable maximum of 5 lb. Accordingly, cost of tare weighing each container must be balanced against the additional amount of product that must be packed in order to compensate for variations in weight of individual drums when average tare weights are used.

Proper maintenance of weighing equipment whether it is automatic, semi-automatic, or just platform scales is an absolute "must" if accuracy is to be attained. Scales should be checked frequently (daily or more often as required) by operating personnel. To facilitate this work, check-weights for the purpose should be kept handy. If automatic packing and weighing equipment is involved the problem is greatly complicated.

This question of effective maintenance extends to all mechanical equipment used in packing operations. The skills required for proper adjustment and maintenance of equipment of this type is far removed from the usual duties of chemical production workers and maintenance employees. To attain low costs, machine attendants and mechanics must be specially trained. It is well to supplement this by arranging for routine inspections by service men in the employ of the equipment manufacturers.

Are your oversize containers overlooked?

Packing operations are always facilitated by the use of oversize containers. This practice can prove expensive. After a container size has been determined it should occasionally be checked in order to compensate for any changes in the bulk density of the product which may be caused by minor processing changes. There is always a tendency to use a standard container for a new product even though it may be larger than required. This prevents increasing inventories of empty packages. This practice is correct if the volume of production is small. If sales increase it then becomes necessary to replace the oversize container with one of proper size. It should not be overlooked.

Do you spend too much on expendable pallets?

There are many false impressions in the minds of shippers concerning economies gained by shipping on expendable pallets. Actually the savings in handling and loading that may accrue to either the shipper or receiving plant are so small that the cost of expendable pallets cannot exceed 30 to 40c. Otherwise, savings would be more than offset by extra cost of pallets. This statement is based on a comparison with efficient carloading methods such as obtained by means of conveyors or fork trucks. As railroads make no dunnage allowances, transportation cost of pallets must be added to the cost of the palletized shipment. Unless the consignee can find a use for the pallets such as intra-plant storage and handling or for outgoing shipments there is little possibility of expendable pallets proving economical for shipper or consignee.

Are you up on all the latest in containers?

Manufacturers have been able to make many improvements in containers by employing better methods of fabrication, by using new materials of fabrication and by adoption of new constructions. Greater emphasis on research and development has been an important factor in this progress. Familiarity with these improved containers will often lead to savings in packaging costs.

Sponsored by the Steel Shipping Container Institute, the Battelle Memorial Institute has been studying the problem of interior linings for steel drums. Although the investigation has not been completed, they have been able to show how some improvements can be made in present lining practices. It is probable that when this study is completed, new linings as well as improvements in present lining practices will result. This will allow the use of lined steel containers for a much larger group of products than is presently possible.

Incorporation of polyethylene into the construction of textile and paper shipping sacks is an important development. Loose or attached liners of this plastic are being used in textile bags. Multiwall paper shipping sacks are fabricated with a ply of kraft coated with polyethylene. The additional protection afforded the product against absorption of water vapor by this construction warrants investigation. There are possibilities of substituting these sacks for more expensive containers.

The 6½ gal. carboy has been in service long enough to prove the economy and safety of this container. It is within the realm of possibility that lower per-trip costs can be attained by using this container than is possible with the larger sizes. Polyethylene bottles up to 12 oz. capacity are blow molded by one concern. Although more expensive than glass they are being used for some special applications such as puffer type dispensers. Development of large bottles fabricated from polyethylene is under way. If successful they will offer many advantages.

An impressive list of fiber drums is offered to the chemical shipper. In addition to the standard all-kraft convolutely wound containers there are drums containing: (1) Asphalt laminated barrier board buried in the sidewalls of the containers. (2) Glassine interior linings. (3) Pliofilm interior linings. (4) Cellulose acetate interior linings. (5) Aluminum foil laminated to kraft board used as linings or buried in the sidewalls. (6) Polyethylene linings either as loose bag-liners or coated to kraft board. (7) Greaseproof linings. (8) Linings designed for free stripping when hot liquid products such as resins are cast in the drums. (9) Plastic wax linings. (10) Paraffin impregnated linings. (11) Exterior coatings of varnish or pigmented paint.

In addition, the containers can be decorated with almost any design in combinations of colors.

Development of small aerosol bombs for pressures of 50 psi. and over offers many possibilities for retail distribution of the products of the chemical industry. Similar improvements made in most other types of containers are too numerous to mention. They are available for the use of wide awake shippers.

Or could you eliminate all this by shipping in bulk?

No discussion of packaging cost is complete without considering the economies that can be effected by shipping in bulk. This method is nearly always less expensive because there is no cost for containers and handling and filling costs are reduced. However, price reductions must be made to compensate customers for the cost of providing facilities for bulk storage. Tank cars and tank trucks either lined or fabricated from steel, stainless steel or aluminum provide means for shipping most chemical products. Shipments by water in bulk or in cargo tanks are becoming more popular because of the added economies in transportation that are possible. Several chemical companies are using this technique.

Tonnage Oxygen Today

Costs, uses, key steps in the evolution of the processes.

One of the best evaluations we've seen—and perhaps the most conservative.

PETER W. SHERWOOD

The last 15 months have seen the first large-scale production of low-cost, high-purity oxygen in the United States. This development may usher in an era of important new techniques throughout the metallurgical and chemical industries.

Industry has embraced this promising newcomer wholeheartedly. Already on stream are a 175 ton per day plant of McCarthy Chemical Co. at Winne, Tex., a 130 ton per day unit designed and erected by Koppers Co. and Air Reduction Co. for Bethlehem Steel at Johnstown, Pa., and a 24 ton per day plant operated by the U. S. Bureau of Mines at Louisiana, Mo. At least four other low-cost oxygen plants are now in various stages of construction. The largest of these, intended for the Carthage Hydrocol synthetic fuel plant at Brownsville, Tex., is rated at 2,000 tons a day—a capacity nearly equal to the total daily output of the numerous plants operating in the United States in 1944 by the classic oxygen manufacturing processes. Plans for the erection of a 400 ton per day low-cost oxygen plant have been announced by Weirton Steel Co. A 360 ton per day plant built by Linde Air Products Co. has gone into operation at Du Pont's Belle, W. Va., plant, while still another oxygen unit is being built by Linde for Wheeling Steel at Steubenville, Ohio.

COST OF TONNAGE OXYGEN AND FACTORS THAT AFFECT IT

Oxygen made by the new processes has a purity of 95-98 percent, slightly below the 99+ of the product manufactured by conventional methods. At the same time, however, the lower-grade "tonnage oxygen" can be manufactured at a cost of only about one-sixth to one-fourth the price of the purer product.

PETER W. SHERWOOD *is engaged as chemical engineer with Koppers Co. in Pittsburgh, Pa.*

While established manufacturers will presumably continue to produce high-grade oxygen by classical methods of air separation for some time to come, it may be expected that the 97.5-98 percent grades of the cheaper tonnage oxygen will eventually make heavy inroads into oxygen-acetylene welding and steel cutting techniques, traditionally the largest-scale oxygen consumers in the country. At the same time, the greatly reduced cost opens the economic utilization of oxygen to many chemical processes which can tolerate the presence of small amounts of impurities but which have hitherto been stunted by the high price of this raw material.

ON COSTS

". . . tonnage oxygen can be manufactured at a cost of only about one-sixth to one-fourth the price of the purer product. . . . Estimates range from an unlikely low of $1.50 per ton to a high of $9. The probable lower limit is between $4 and $5 per ton."

Actual operating cost figures for tonnage oxygen have not so far become available. Estimates range from an unlikely low of $1.50 per ton to a high of $9. The probable lower limit is between $4 and $5 per ton. The actual price at which oxygen can be manufactured is largely a function of plant size, energy sources and bookkeeping methods. Capital cost is a very sizable item and amortization plus interest may amount to as much as 60 percent of the total cost. Energy is consumed at the rate of approximately 350-400 kwh. per ton. In locations where energy must be charged at 0.7 c. per kwh., this represents a cost of $2.80. In other instances, the cost of energy may be very much lower. This is the case, for example, in Fisher-Tropsch plants located at some distance from fuel-consuming areas. In such plants, a tail gas of low heating value is formed as a byproduct, whose cross-country shipment is uneconomical. Under these circumstances, energy can be made available to the oxygen plant at substantially the prorated capital charges and operating costs of the power plant plus only a relatively small price for the heating value of the gas which must, in fairness, be credited to the synthesis plant.

In many chemical and especially metallurgical processes which employ high-grade oxygen, such inexpensive heat sources are not available. The cost of oxygen is thus intimately related to the operating locality and to the nature of the process in which oxygen is employed.

MANUFACTURING ADVANCES THAT LED TO TONNAGE OXYGEN

Until 1948, all of the oxygen manufactured in the United States was produced by classical methods based on the original work of Linde in 1910, and Claude and Heylandt shortly thereafter. Oxygen made by these methods is characterized by a particularly high degree of purity. Chemical usage is high and energy is consumed at the rate of about 440 kwh. per ton (in an 18 ton per day plant). Manufacturing costs vary between $36 and $45 per ton.

In all commercial processes for the manufacture of oxygen from air, the separation is effected by fractional distillation, whereby oxygen constitutes the bottoms and nitrogen the overhead. Streams rich in argon and krypton can be withdrawn at intermediate points of the distillation column. To avoid plugging of the apparatus, the incoming air must be rigidly freed of carbon dioxide, moisture and hydrocarbons. Original methods, employing one-stage distillation columns resulted in an impure nitrogen product and consequent losses of oxygen amounting to as much as 19 percent of the total make. This operating method has therefore been almost universally superseded by the double column in which primary air separation yielding nearly pure nitrogen and 40 percent oxygen is operated at 5.6 atm. and the

final oxygen purification is carried out at essentially atmospheric pressure. The lowest temperature in the system is required at the top of the low-pressure column. This is provided by a very ingenious arrangement in which the temperature of supercooled high-pressure (5.6 atm.) nitrogen is further lowered by the Joule-Thompson effect developed in the course of flashing to atmospheric pressure.

Most of the refrigerating capacity of the outgoing nitrogen and oxygen streams is utilized for the purpose of precooling the incoming air. In the classic processes this is carried out in tubular heat exchangers. Additional cooling must be provided by the application of work. The theoretical work requirements are satisfied by compressing about 75 percent of the total air to 5.6 atm. Cold losses and inefficiencies are compensated partly by ammonia cooling and partly—in one typical system—by compressing a small portion of the air to 200 atm.

In 1930, Frankl suggested the substitution of cyclically-operated regenerative heat exchangers for the shell-and-tube heat exchangers which had been hitherto employed. The improvement permitted great reduction in capital cost and the removal of impurities from the air by condensation on the heat exchangers, avoiding, largely, the expensive chemical purification methods which had previously been practiced. At the same time the over-all pressure drop was reduced. This invention, together with certain improvements in the thermodynamics of the process, the substitution of more efficient turbo-compressors for reciprocating engines, and the installation of expansion turbines, resulted in very great reduction in the cost of oxygen manufacture and opened the way for today's tonnage oxygen.

Since Frankl's invention, there have been a number of improvements, and processes credited to Kellogg Co. and Elliott Co. in the United States, Air Liquide Cie. in France, and Kapitza in Russia have shown various advantages and some promise. A detailed discussion of these methods of oxygen production is beyond the scope of this article, however, and the interested reader is referred to publications dealing especially with this subject.[1, 2, 3, 4]

USES FOR TONNAGE OXYGEN

1—MAKE SYNTHESIS GAS

Probably one of the most attractive large-scale uses for oxygen is in the production of synthesis gas from solid fuels or hydrocarbons. Processes toward this end have been developed during the past decade which promise not only to produce synthesis gas more cheaply than is now possible in many locations, but also to widen the raw material base for the production of synthesis (and water) gas.

In this connection, "synthesis gas" is a mixture of carbon monoxide and hydrogen in various proportions which serves as raw material for a large number of chemical processes. Thus, it is the starting point for the synthesis of methanol, hydrocarbons produced by the Fischer-Tropsch process, alcohols and aldehydes manufactured by some version of the Synol or OXO processes, and all the innumerable derivatives of these compounds. By a comparatively simple reaction with steam, carbon monoxide present in the synthesis gas may be converted to hydrogen. A very high grade of hydrogen may be produced in this manner to serve as raw material for ammonia synthesis, coal and petroleum hydrogenation, vegetable oil hardening and the myriad of other processes in which hydrogen is essential.

PRESSURE GASIFICATION

". . . Pressure operation has thus very definite advantages for town gas manufacture, but its immediate usefulness for chemical purposes is limited. . . American fuel situation does not warrant any approach in which methane is purposely dragged as ballast throughout the synthesis."

Pre-Oxygen Processes: Disadvantages—For most of these purposes, the presence of nitrogen is quite objectionable. The major portion of synthesis gas manufactured today is produced in one of the following ways: (1) By the discontinuous action of steam on coke which has been preheated to reaction temperature—for example, by an air blow during the non-producing period; (2) by the action of steam on hydrocarbons (usually methane). The necessary heat of reaction is provided by the external combustion of fuel gas.

Disadvantages of processes of the first type are to be found in their discontinuous nature and in the need for coke which is, after all, a fairly expensive fuel. Certain coke-operated synthesis gas processes (for example, Pintsch-Hillebrand) eliminate the air blast by providing all the needed heat by means of highly preheated steam and recycle gas. Drawbacks of this approach are also glaring, however.

Processes of the second type require quite expensive equipment, capable of carrying out the high heat transfer requirements. Fuel consumption is high.

Oxygen Processes: Advantages—The availability of high-grade oxygen at low costs opens up the possibility of carrying out the two overall gasification reactions simultaneously, without introducing undesirable impurities:

$$C + H_2O \longrightarrow CO + H_2 \text{ (endothermic)} \quad (1)$$

$$C + \tfrac{1}{2}O_2 \longrightarrow CO \text{ (exothermic)} \quad (2)$$

Reaction (2) supplies the necessary heat for the endothermic first reaction.

Oxygen gasification thus offers very definite advantages in that it permits continuous operation, the maintenance of a fairly uniform temperature, and independence from external heat sources. The combustion process itself, required for reasons of heat balance, yields a useful product. By obviating the necessity for good heat transfer conditions, the use of powdered coal becomes possible and low-grade fuels become fully adequate raw materials.

Kerpely & Gasification—Oxygen gasification of coke in standard Kerpely gas producers has been carried out with strikingly high thermal efficiencies. According to Denig[5] up to 88-90 percent of the incoming fuel value can be recovered in the gaseous products. An additional 2-3 percent of the input heat is employed usefully for the generation of waste steam. This compares very favorably with the 61 percent efficiency (69 percent including waste steam generation) normally encountered in cyclically-operated standard water gas machines.

Bureau of Mines & Gasification—The first large-scale oxygen-fired coal gasification unit in the United States has recently been taken on stream at the coal-to-oil demonstration plant of the U. S. Bureau of Mines at Louisiana, Mo. Developed and constructed by Koppers Co., this unit gasifies finely powdered coal in the presence of oxygen and highly superheated steam. Operation is continuous. Demands on the physical characteristics of fuels employed in units of this type are quite negligible, a fact which lends them their great versatility. Low-grade brown coal can be used as readily as coke dust. The oxygen-steam-fuel ratio sets the temperature inside the gasifier and is determined primarily by the relative reactivity of the fuel. The sensible heat of the hot outgoing gases is largely recovered in this as in other gasification units by the generation of steam in a waste heat boiler.

Winkler & Gasification—Historically, the first commercially successful oxygen-fired coal dust gasification unit is credited to Winkler who employed a fluidized bed of solid fuel. Large carbon losses in the flue dust of Winkler gasifiers have pointed up definite shortcomings in the design. The unit has been employed at several German plants, notably Leuna and Böhlen, which were operated on a

lignite basis. Pilot plant work along these lines is reported to be carried on by Pittsburgh Consolidation Coal Co.

Lurgi & Gasification—A promising process for the oxygen gasification of non-coking coal under pressure is credited to Lurgi G.m.b.H. As may be expected from the effect of pressure on the equilibria involved, methane content of the make gas is quite high, ranging in the case of one particular coal from 9 percent at 10 atm. to 14 percent at 30 atm. in the crude gas. Pressure operation has thus very definite advantages for town gas manufacture, but its immediate usefulness for chemical purposes is limited. There is an undoubted attraction in receiving the synthesis gas under pressure, thus effecting a considerable saving in compression charges. However, methane interferes in one way or another with the effective execution of most of the major reactions in which synthesis gas is employed.

A subsequent oxygen gasification of the methane content of pressure-produced synthesis gas has been shown to be feasible. This approach opens certain potentialities for the use of pressure gasification for chemical purposes.

The inventors of the Lurgi process have attempted to turn the drawback of the high methane content of Lurgi gas into a virtue. They point out that a high methane content in the feed gas to the Fischer-Tropsch process will result in a tail gas of sufficient heating value to warrant long-distance transmission. It must be pointed out, however, that the economic practicability of this approach is doubtful, at best. In any case, while it may at least be considered for Western European conditions, the American fuel situation does not warrant any approach in which methane is purposely dragged as a ballast throughout the synthesis.

Slagger & Gasification—Slagging-type gas producers, akin to blast furnaces, may be employed for the continuous oxygen gasification of coke or non-coking lump coal with low-melting ash. Prominent units of this type are credited to Thyssen-Galocsy and I. G. Farbenindustrie A. G. (Leuna). This writer is not aware of the commercial application of such units anywhere in the United States.

Underground Gasification—Now under way are important experiments at Gorgas, Ala., for the study of underground coal gasification by means of oxygen-enriched air. The need for enrichment is particularly great in this case in order to maintain the surface of the coal seam at reaction temperature and in order to produce a make gas of satisfactory heating value. Results from Gorgas touching on this point are not yet available. The expected improvements have, however, been verified by Russian workers in underground gasification experiments carried out at Gorlovka.[8] By increasing the oxygen content of the blast from 21 to 70 percent, the heating value of the make gas rose from 108 to 286 Btu. per cu. ft., while the nitrogen content dropped from 63.3 to 11.8 percent.

ON ACETYLENE

". . . Assuming methane at 15c. per million Btu. and oxygen at $5 per ton we have estimated acetylene costs at 6.7c. per lb. in 70 percent concentration, and 4.2c. per lb. in 8-16 percent concentration. This compares favorably with other methods of acetylene manufacture."

Methane & Gasification—Presently, one of the most promising fields for oxygen is the reforming of hydrocarbons, notably methane. The process, involving the partial combustion of methane with simultaneous or subsequent methane-steam reaction is capable of yielding particularly inexpensive synthesis gas. The Brownsville plant of Carthage Hydrocol is based on this approach to methane gasification.

It should be noted that there are numerous plants throughout the country employing the catalytic, externally heated steam-methane reactions which are either too small or too old to take advantage of the simpler processes based on newly arrived tonnage oxygen. It must be also remembered that both types of processes are strictly competitive, whereby the decisive factors are the cost of methane and oxygen achieved in the locality of the plant.

Typical mode of carrying out the "gasification" of methane is a two-step operation. In the first stage, part of the methane is burned to carbon dioxide and steam by the purely thermal action of oxygen. In the second stage the combustion products (plus added steam and carbon dioxide) are allowed to react with residual methane in the presence of a nickel-base catalyst. The endothermic heat of the secondary reaction is provided by the sensible heat of the reaction gases, accumulated in the first stage.

USES FOR TONNAGE OXYGEN
II—MAKE ACETYLENE, ETHYLENE

Acetylene—Partial combustion of gaseous hydrocarbons by means of oxygen is one of three methods of producing acetylene from petroleum gases. Under suitable local conditions, this approach has definite economic advantages and it is reported to be the method by which Carbide and Carbon Chemicals Corp. will manufacture acetylene in its projected plant at Texas City, Tex.[9]

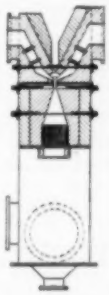
As in the case of acetylene production by purely thermal or electric arc methods, the underlying principle of the partial combustion process is to raise the gases rapidly to a very high temperature level (1,250-1,550 deg. C.) and quenching the product within a fraction of a second thereafter in order to minimize the breakdown reactions of acetylene.

In order to achieve the very high required temperatures and to minimize explosion hazards, a fairly pure feed of hydrocarbon and of oxygen is required. For the purpose of oxygen conservation, the feed gases are separately preheated to 400 deg. C. and are then mixed. (A higher degree of preheat would raise the hazard of backflashing in the unit.)

At thermal balance, the over-all reaction occurring in the process can be expressed:

$$45\ CH_4 + 30.25\ O_2 \longrightarrow 8\ C_2H_2 + 3.5\ CO_2 + 25.5\ CO + 54\ H_2 + 28\ H_2O \qquad (3)$$

Results on the operation of a pilot plant producing acetylene by the partial combustion of methane have become available from the Oppau plant of I. G. Farbenindustrie, A. G. This drawing shows the burner employed in the process. Special attention is called to the narrow tubes above the combustion chamber through which the gasses pass above the critical velocity in order to minimize the danger of backflashing.



Burner developed by I.G. for partial combustion of methane to produce acetylene.

It was found that an acetylene yield amounting to 31 percent of theory (based on methane) could be obtained. Oxygen consumption is 5.7 lb. per lb. of acetylene. Typical raw gas composition, in percentages, is: 8-9 C_2H_2, 3-4 CO_2, 6-7 CH_4, 24-26 CO, 56 H_2 and 0.1-0.2 diacetylene Purification is brought about by taking advantage of the water-solubility of acetylene. The use of such organic

solvents as cellosolve or acetone appears promising in this connection.

The economic limit of acetylene purification produced by partial combustion of methane is between 70-80 percent, the principal residual impurity being carbon dioxide. Assuming methane at 15c. per million Btu. and oxygen at $5 per ton, we have estimated[10] acetylene costs at 6.7c. per lb. in 70 percent concentration, and 4.2c. per lb. in 8-16 percent concentration. This compares favorably with other methods of acetylene manufacture and makes the process particularly attractive where a low-percentage acetylene stream satisfies the chemical requirements. It should be noted that the byproduct of the process is synthesis gas which may be employed for other processes within the plant. For the acetylene cost estimate, this has been assumed at a mere 15c. per million Btu. If employed for chemical purposes, its actual value is several times this assumed cost.

Ethylene, Propylene—A somewhat similar process has been developed for the production of ethylene and propylene by the partial oxygen combustion of ethane and propane. A plant producing 13,000 tons of ethylene per year by this process has been operated at Leuna, Germany.[11] The reaction temperature is appreciably below that employed in the acetylene process, ranging between 700 and 870 deg. C. Operation is under a partial vacuum. Small amounts of acetylene, formed in the course of the process, can be removed by preferential hydrogenation to ethylene. It takes 350 cu. ft. of oxygen and 800 cu. ft. of ethane to yield 450-500 cu. ft. of ethylene. Typical raw gas concentration is 30-35 percent ethylene.

In view of the fairly low temperatures involved in ethylene production, it is doubtful whether this partial oxidation process can compete successfully with thermal ethylene manufacturing processes now being practiced in American refineries and petrochemical plants. Under U. S. conditions now prevailing, the cost of oxygen may be expected to outweigh the value of the greater fuel expenditure in thermal processes.

Other Hydrocarbon Oxidation Products—As a rule, the oxidation of hydrocarbons to oxygenated products must be carried out under mild conditions. In the operation of processes such as the production of ethylene oxide by air oxidation of ethylene, the presence of an inert gas is essential for better temperature control—and to avoid explosion hazards. In such instances, the use of air is preferable to oxygen. The amount of diluent nitrogen in air may, in fact, not be sufficient, and additional inert gas must be introduced.

In such instances the possible advantage of oxygen is that it permits the selection of any desired inert instead of requiring the presence of nitrogen. Certain benefits can be derived from the use of a condensable inert, such as steam, which can be readily separated from the products. High-grade oxygen is employed for the manufacture of aldehydes and alcohols from hydrocarbons at McCarthy Chemical.

The use of ozonized oxygen has been recommended for the catalytic production of formaldehyde from methane.[12] While air is found to be equally effective, the smaller feed gas volume in oxygen operation has the advantage of lowering power requirements for ozone production.

USES FOR TONNAGE OXYGEN
III—METALLURGICAL INDUSTRY

Bessemer — Particular importance has been attached to metallurgical employment of tonnage oxygen. Much headway has been made in the study of conditions required for the use of oxygen in Bessemer converters. Advantages of this application include a shortening of the operating cycle, increase in permissible scrap charge, widening of the raw materials base, and reduction of the danger of nitrogen saturation of the steel.

Open Hearth—Considerable experimental work carried out in recent years regarding operation of the open hearth with addition of oxygen has shown the possibility of decreasing cycle time by as much as 10-25 percent. An incidental advantage of this operating scheme is the reduction in iron ore and limestone requirements and consequent decrease in metal losses with the slag. Fuel savings of about 8 percent have been reported and even greater thermal savings are believed to be possible by adaptation of furnace design to the requirements of oxygen firing.

Blast Furnace—The use of oxygen in blast furnace operation dates back to the early thirties. Operation was carried out in an experimental furnace with enriched air containing up to 27 percent oxygen. Increased throughput rates and coke savings amounting to 10-15 percent were thereby achieved.

Limiting oxygen concentration in the blast to standard blast furnaces is about 27 percent. Since, under such conditions, the top gases will have been reduced to a temperature of 212 deg. F., no advantage can be derived from further enrichment.

Recent publications by Hellbrugge[5] and Pollitzer[6] report the successful use of 40-55 percent oxygen blast in an experimental blast furnace characterized by a particularly low shaft. By raising the oxygen concentration of the blast even higher in specially designed furnaces, it may become possible to operate such units for the simultaneous production of iron and synthesis gas. The application of such furnaces in connection with low-grade ores and coals has been advocated.[6]

The high temperatures which can be attained by the partial elimination of nitrogen from the blast open the way for the direct production of ferromanganese and ferrosilicon in coke-fired furnaces. Advances along these lines have been reported from Germany and Russia.

Sulphides & Sulphuric—Possibilities for low-cost oxygen exist in the fields of nonferrous metallurgy. In the smelting of sulphide ores, the use of oxygen will result in the formation of a more concentrated and more readily recoverable sulphur dioxide. Additional advantages are seen in the high temperatures which can be achieved and in the reduction of outside fuel requirements for many applications. Studies now under way are concerned with the use of oxygen-enriched air in the smelting of nickel, zinc, lead, and copper ores.

It is found that the high roasting temperatures achieved with oxygen result in higher reaction rates and therefore much greater roasting capacities.

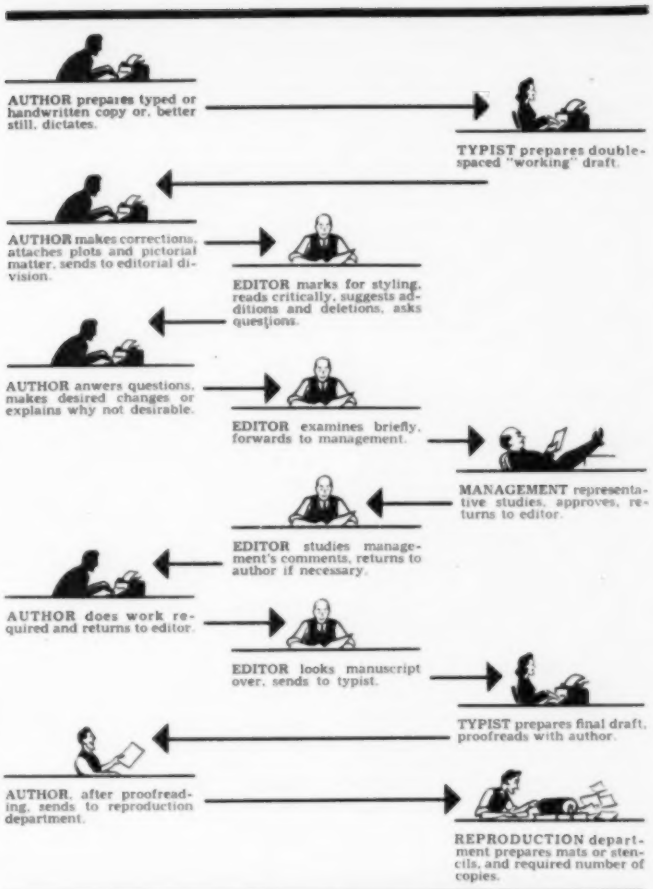
The advantages of applying oxygen to the roasting of sulphide ores carry on into the manufacture of sulphuric acid. The use of oxygen results in much greater capacity per catalytic chamber, in better heat economy, and in simpler sulphur trioxide absorber operation. These effects are, of course, realized as a result of the higher possible operating temperatures and the reduction in inert gas.

REFERENCES

1. Ruhemann, M., The Separation of Gases, London, 1940.
2. Howat, D. D., *Chemical Age* (London), June 14, 1947, et seq.
3. Lobo, W. E., *Chem. Eng. Progress*, **1**, 21-26 (1947).
4. Van Dyke, H., *Pet. Refiner*, **27**, 122-6 (Oct. 1948).
5. Hellbrügge, H., *Stahl u. Eisen*, **69**, 256-8 (1949).
6. Pollitzer, W. M., Utilization of Oxygen in the German Iron and Steel Industry, FIAT Final Report No. 1202 (1947).
7. Denig, F., Paper presented before Charleston (W. Va.) section of Amer. Inst. of Chem. Eng., March 15, 1949.
8. The Underground Gasification of Coal, The Gas Research Board (London), Information Circular No. 2 (1948?).
9. Anon., *Chemical Industries*, July 1949, p. 29.
10. Sherwood, P. W., *Pet. Refiner*, Nov. 1948.
11. Matthews, M. A., Oxidation of Hydrocarbons to Ethylene, BIOS Final Report No. 877 (1946?).
12. Sherwood, P. W., The Oxidation of Methane to Formaldehyde, FIAT Final Report No. 608 (July 1946).

Say you're a consulting firm, for instance. Or anyone whose sole tangible product is a technical report. Do you make an effort to style it for customer appeal? You may be missing a bet if you don't know. . . .

HOW TO USE AN EDITOR


AUTHOR prepares typed or handwritten copy or, better still, dictates.
TYPIST prepares double-spaced "working" draft.
AUTHOR makes corrections, attaches plots and pictorial matter, sends to editorial division.
EDITOR marks for styling, reads critically, suggests additions and deletions, asks questions.
AUTHOR anwers questions, makes desired changes or explains why not desirable.
EDITOR examines briefly, forwards to management.
MANAGEMENT representative studies, approves, returns to editor.
EDITOR studies management's comments, returns to author if necessary.
AUTHOR does work required and returns to editor.
EDITOR looks manuscript over, sends to typist.
TYPIST prepares final draft, proofreads with author.
AUTHOR, after proofreading, sends to reproduction department.
REPRODUCTION department prepares mats or stencils, and required number of copies.

PRODUCTION LINE FOR TECHNICAL REPORTS. Editor's contribution: catch slips of grammar and fact—insure an effective job, easy to read and understand.

D. S. DAVIS

In connection with technical writing, Hopkins[2] and the author,[1] respectively, discussed the organization and preparation of chemical engineering reports. The present paper completes the triology with a consideration of the editing of such material.

A technical report is usually the sole tangible product of many firms of consulting chemists and chemical engineers, research institutes, experiment stations and government bureaus. These organizations—as well as many manufacturers of heavy chemicals and chemical engineering equipment—have found it difficult to attain uniformity in the literary quality of reports that are prepared, necessarily, by a number of chemists and chemical engineers of varying training and capabilities. Some organizations find it advisable, therefore, to maintain an editorial division. This article tells how such a division can be set up.

D. S. DAVIS, *who is professor of chemical engineering at Virginia Polytechnic Institute in Blacksburg, didn't just "dream up" this article; it is based on his wide experience in technical editing for a number of research organizations.*

THE STAFF SETUP

The minimum editorial staff should consist of one technical editor and one secretary capable of serving satisfactorily as a manuscript assistant. The editor should be a chemist or chemical engineer who has had the foresight to supplement broad industrial experience with the kind of unique and invaluable training that can be gained only by writing extensively for the technical press.

The editor's secretary should be a college graduate who has majored in English and who is thoroughly grounded in science and mathematics. Fair proficiency in typing and shorthand are needed and the ability to set up and maintain an adequate system of files and records is a prerequisite. A competent editor, aided only by a good manuscript assistant, can handle a surprising volume of reports—once he has earned the cooperation of his authors. The addition of one or two assistant editors, which results in freedom from harrowing detail and in improved work, enables the scope of the editorial division to be widened materially.

At the inception of an editorial division (sometimes known as "edivision") there should be a clear understanding between the management and the editor as to the exact nature of the work and its limits. Company policy, as far as it pertains to the division, should be stated in writing and there should be agreement on matters of styling. Though the editor is familiar with the best practices in report writing and is competent to set up a style manual, he will need to take cognizance of minor preferences and idiosyncracies on the part of the management. A frank discussion and careful delineation of such matters at the very start will favor smooth functioning of the editorial division and do much to insure improved reports. Once that styling, for instance, has been agreed upon there should be no directives from management to the engineering authors.

Each report should be read at least three times: twice for manuscript styling and once for content and logic. When the editor and manuscript assistant are handling all the work, the assistant should read the reports first and mark the manuscript for final typing. This procedure enables the editor to read the reports with only sense and logic in mind. Freed from attention to mechanical detail, he is able to concentrate on the more essential features: (1) agreement between the abstract, discussion of results and summary, (2) advisability of the recommendations and (3) discussion with the author and with the management when necessary.

EQUIPMENT AND ROUTING

Every editorial division needs a small library or adequate bookshelf of its own. The accompanying table lists some of those books that are real necessities when editing chemical and chemical engineering reports.

Webster's "Collegiate Dictionary" is ideal for desk use but recourse to an unabridged dictionary is often necessary. Mawson's revision of Roget's thesaurus provides a convenient source of synonyms and words of exact shade of meaning desired. Fowler's "Dictionary of Modern English Usage" is helpful in settling many doubtful points. In the frequent arguments with engineering authors, the editor is on safe ground when he has Fowler on his side. Hackh's "Chemical Dictionary" provides a wealth of information and is a reliable guide through the maze of chemical names which is often so confusing. "Words Into Type" by Skillin and Gay is authoritative and covers styling details in a very thorough manner.

The mechanism of handling the rough drafts of technical reports varies from concern to concern. One system of proved value is shown in the accompanying "editing flowsheet."

Proofreading should always be done by the author and his typist and not by the editor or his assistants. When reading the report in its final form the author has an opportunity to catch minor typographical errors which might not be noticed by others but which would mar the report inexcusably. Thus, "alkane" for "alkene" and "amylose" for "amylase" might easily escape anyone but the author.

FUNCTIONS OF THE EDITOR

The astute technical editor serves largely in an advisory capacity and avoids tedious routine. With suggestions as to effective presentation, styling and clarification, he assists the engineering authors in turning out reports that will meet the requirements of management. Although he is usually better qualified than anyone else in the organization to prepare technical reports, he should avoid such inefficient use of his time and devote his energies rather to helping others with their writing. He may actually be in a position to insist that good practice be employed and that his preferences with regard to essentials be observed, but the far-sighted editor will take the trouble to convince the authors of the desirability of the changes and will yield, readily, on matters of minor importance. If he is to do his work effectively and with a minimum of strain, he will find that time spent in teaching his authors what they should have learned in a good college course in technical writing is far from wasted.

Since the editor makes no changes without good reason, it is always best to retain the author's wording as long as it does not violate the principles of grammar. However, the editor should submit alternative forms of expression for the author's consideration and suggest that he make other choices.

In launching a program of technical editing, the editor will find it most helpful to decide upon a definite system of styling, adhere to it, and to defend it vigorously if necessary. When, for instance, his authors ask, "In tables and plots, why don't we use "p.s.i." for pounds per square inch?" he is in a position to state that the agreement with management has been to follow recognized styling and that, accordingly, "lb./sq.in." is to be used.

In reading the report critically, the editor should place himself in the position of one technically trained but not extremely familiar with the subject matter of the report. He will begin his reading with the introduction rather than with the abstract and he will do well to ask himself a number of questions: Are the purpose and scope of the investigation clear? Has the author oriented the reader sufficiently and are special, unfamiliar terms defined in an adequate manner? Is there a background of earlier work in the field and has the essential theory been developed far enough to prepare the reader for any new and more involved theoretical considerations.

When reading the section devoted to experimental work, the editor should take particular note of the apparatus and equipment and make sure that pertinent sketches are complete and that the descriptive matter is really informative. Has the author specified his materials and reagents in sufficient detail? Are there any gaps in procedures? Are the data presented in convenient tabular and graphical form? Could a simple nomograph or line coordinate chart replace a lengthy table to advantage?

When examining the discussion of results, he should notice whether a further presentation of theory is necessary and really belongs in that section or whether it could be included in the introduction or held over for the appendix with profit. No discussion is complete without definite statements as to the significance of the data and attention should be given to a pre-

THESE ARE THE BASIC TOOLS

Webster's Collegiate Dictionary, 5th edition, G. and C. Merriam Co.

Webster's Unabridged Dictionary, 2nd edition, G. and C. Merriam Co.

"Roget's Thesaurus of the English Language in Dictionary Form with an Appendix of Foreign Words and Phrases," Garden City Publishing Co., Inc.

Fowler's "Dictionary of Modern English Usage," Oxford University Press, New York.

Hackh's "Chemical Dictionary," 3rd edition, The Blakiston Co., Philadelphia.

Bennett's "Concise Chemical and Technical Dictionary," Chemical Publishing Co., Brooklyn, 1947.

Perry's "Chemical Engineers' Handbook," 2nd edition, McGraw-Hill Book Co., New York.

"Words Into Type," by Skillin and Gay, Appleton-Century-Crofts, New York, 1948.

Those volumes of the McGraw-Hill Chemical Engineering Series that pertain to the immediate field.

cision study. The editor should note whether deficiencies of the experimental work are touched upon in a manner at once fair to the reader and the organization, and whether adequate suggestions are made for future investigations. He should ask himself: Is the summary in accord with the purposes stated in the introduction and does it keep faith with the abstract and discussion of the results? Do the literature references appear to be correct and are they complete with respect to volume and page numbers? Does the appendix contain material that should appear in the body of the report? Is the abstract concise but informative and is the title definitive and lucid?

Since much of the time of an industrial editor is spent in teaching, he will find it helpful to (1) follow the technical journals and trade papers in the field of his organization, (2) issue frequent bulletins to his authors and (3) meet with them informally for the purpose of discussing problems which bear on report writing. The literature will keep the editor in touch with the special language, abbreviations and symbols that attend every technology. One-page mimeographed bulletins afford him a chance to bring styling changes, grammatical rules and repeated errors to the attention of those who write the reports. Occasional blackboard meetings serve to revive interest in terse expression, to point out amusing typographical errors and, in a large organization, to acquaint the editor and the authors.

FUNCTIONS OF THE ASSISTANT

A good manuscript assistant is invaluable in freeing the editor from annoying detail and in facilitating the smooth flow of reports through the division. An alert girl who has had good collegiate training in English and science and who can keep somewhat temperamental engineering authors in a good humor makes the best assistant. The position calls for a sense of organization, the ability to maintain files in good order and facility in setting up practicable systems of records. A girl who can assume the tedious and repetitious task of marking rough drafts for styling and who can take time to explain—in a courteous but firm manner—some of the niceties of English grammar and practice in technical writing to the authors, strengthens the division markedly.

The editor and his assistants must constantly watch for comma faults, sentence fragments, fused sentences, incomplete construction, dangling participles and infinitives, errors in spelling, weak and remote references, inconsistencies in number, unorthodox capitalization, technical and industrial jargon, incorrect use of relative pronouns, split infinitives, unwise choice of tense and mood, stilted and involved sentences, unfortunate connotation, lack of suitable headings, failing to provide transition sentences between headings of a different order, Spoonerisms, inadvertent rhyming, text matter dependent upon headings for its meaning, excess verbiage, colloquialisms, inexact and archaic expressions, sentences of inordinate length, incorrect word order, repetition of words and phrases, unfamiliar abbreviations, interchanged figure, table and equation numbers, faulty nomenclature and the use of other than standard symbols.

Finally, they must examine each legend, scale and title on a plot, guard against use of mathematical terms in a loose sense, check sample calculations, derivations and equations and make sure that other authors are credited with prior work.

BIBLIOGRAPHY

(1) Davis, D. S., *Chem. Eng.*, **54** (1) 97 (1947).
(2) Hopkins, B. H., *Chem. Met. Eng.*, **53** (6) 110 (1946).

New Publisher

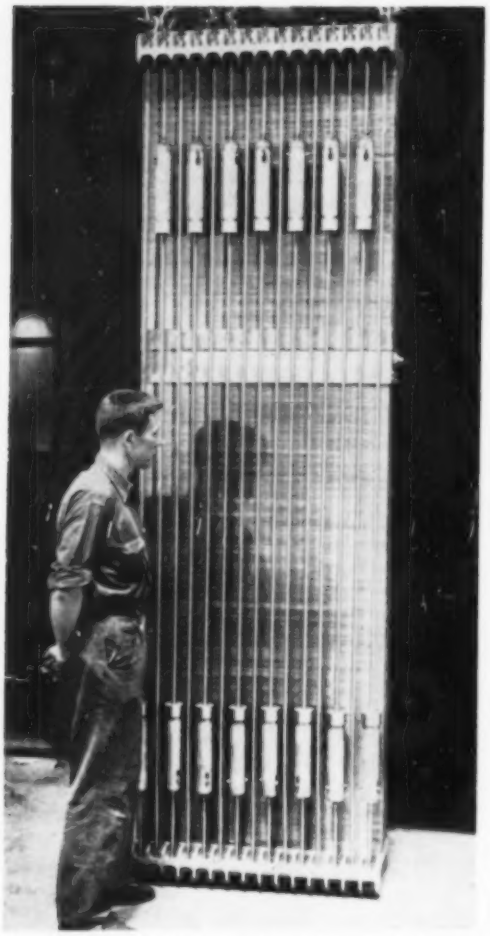
Ex-Publisher

Traendly Succeeds Williamson

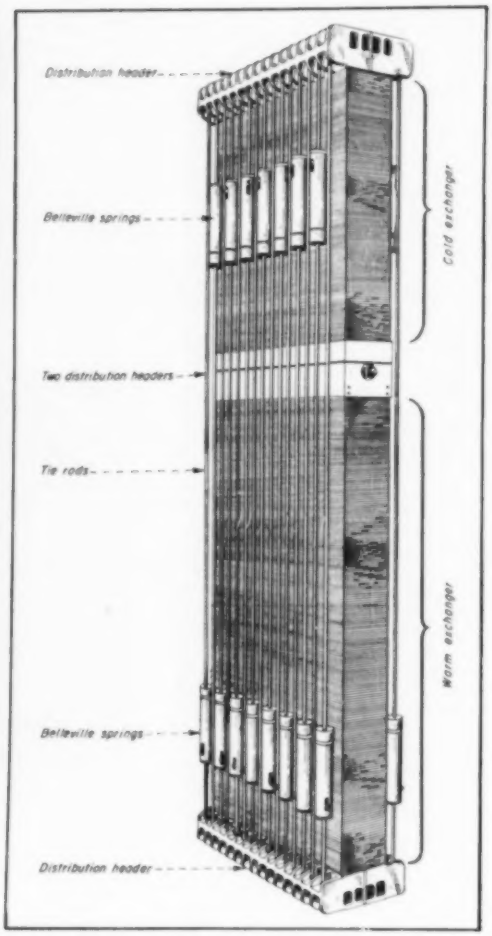
Chemical Engineering has a new publisher. M. A. Williamson, vice president, McGraw-Hill Publishing Co., and publisher of *Chemical Engineering* since 1938, has relinquished the latter post. He has been succeeded by Wallace F. Traendly, former vice president and director of Reinhold Publishing Corp.

M. A. Williamson joined McGraw-Hill in 1920 as our sales representative in the Philadelphia area. Since then "Maje" Williamson's name and "*Chem & Met*" (and *Chemical Engineering*) have grown to be synonymous in the minds of many of our readers and advertisers. In 1929 he was made publishing director, business manager in 1936, and publisher in 1938. He was made a vice president of McGraw-Hill in 1938 and elected to the board of directors in 1939. He leaves a magazine that he helped to make outstanding in its field. His new duties with the McGraw-Hill company entail a survey of company publishing policies.

"Wally" Traendly (rhymes with "friendly") brings to his new job an exceptional background and training. He attended Colgate University and was graduated from Pratt Institute in chemical engineering. Before joining the Reinhold company he was in technical sales work with International Nickel Co., Victor Chemical Works and Westvaco Chlorine Products Corp. For the last ten years he has been with Reinhold Publishing Corp. and has recently served as vice president and as a director. He joined Reinhold as a sales representative of the Chemical Engineering Catalog and of the American Chemical Society publications. Since April 1947 he has been advertising manager of *Industrial and Engineering Chemistry* and the other ACS publications.



Commercial sizes of this new exchanger have already been fabricated. This one cools 3,000 pounds of air per hour.



External components of the exchanger are shown above. The heart of the unit is the series of piled plates and gaskets.

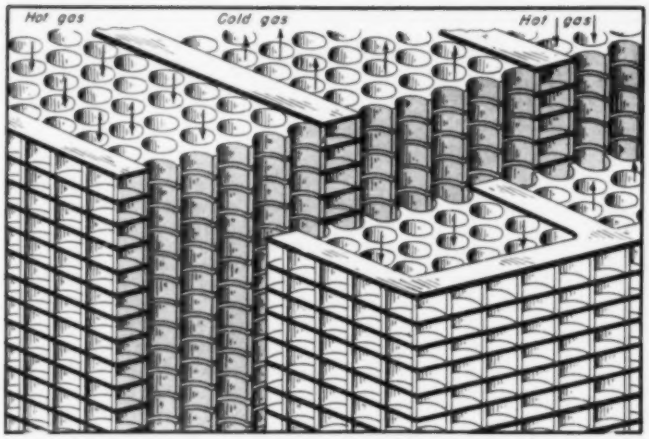
A. D. Little's New Heat Exchanger

On gas-to-gas exchange, this unit gives heat transfer rates as high as 237—looks inexpensive to build—may be a natural for oxygen plants. Here, in an exclusive story, are construction details and operating results.

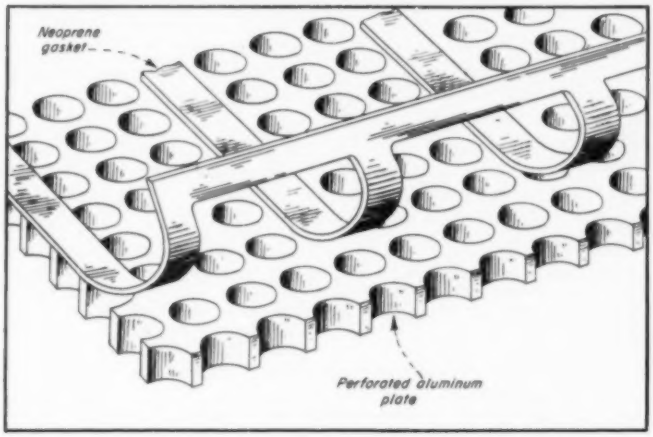
ROGER WILLIAMS, JR.

At the end of the war, large scale use of low cost, low purity oxygen was forecast on all sides. Surprisingly enough, few actual plants have been installed. One of the major reasons was that the heat exchangers required cost more than the optimists hoped. Consequently, all the companies with a stake in oxygen have been working

ROGER WILLIAMS, JR., *an Associate Editor of* Chemical Engineering, *has been following the development of this heat exchanger since early 1948, waiting for the time when the story could be made public.*



Interior of the exchanger consists of alternating punched metal sheets and gaskets which divide the unit into hot and cold vertical passages.



Gaskets, greater than hole diameter, prevent escape of gas from one passage to next, even if gaskets are not perfectly aligned vertically.

feverishly on heat exchanger designs.

Not the least of these companies was Arthur D. Little, Inc. This month they are announcing, for the first time, a radically different type of gas-to-gas heat exchanger, based on research work that started over three years ago. The exchanger is different, has high heat exchange rates, takes up small space, is versatile, is simple to manufacture without extensive tooling up, and, best of all, looks inexpensive. True, the exchanger is still experimental—only a few large scale units have been built—but all the evidence points to success. Patent applications are in and the company feels that the exchanger is sufficiently advanced so that it can undertake design of units for special installations, and can consider making arrangements for large-scale manufacture.

HOW IT WORKS

The way the exchanger works is shown in the illustration, as far as construction goes. The basic idea, from which the exchanger was conceived, was to disrupt any laminar gas film that built up on the exchange surface. Little's engineers did the job by alternate expansions and contractions through, in effect, closely spaced orifices.

Gas, to be heated or cooled, flows through one of the holes in one of the aluminum plates, then into the space between plates, then through another hole, and so on. The slight alternate expansion and contraction of the gas stream effectively destroys any laminar film—gives turbulence, even though the gas flow might normally be in the laminar range.

In the units built so far, the holes in each plate are aligned with those in the plates above and below. One reason for doing this was to make an experimental exchanger whose characteristics were definable and reproducible. If the holes were not aligned the statistical degree of misalignment would be hard to define. In assembling the exchanger, alignment is not a serious problem.

Proof of the effectiveness of this type exchanger is the high heat transfer rates actually achieved. On a test unit, heating and cooling air, a rate of 237 Btu./(hr.)(sq.ft.)(deg.F.) was reached—and this with reasonable pressure drop.

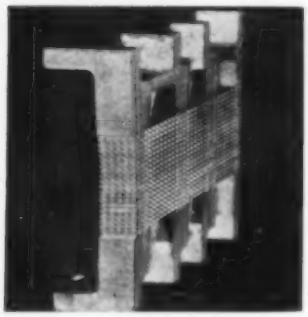
Although this exchanger, like other finned exchangers, is primarily adapted to gas-to-gas heat exchange, the A. D. Little engineers feel that there may be applications in gas-liquid and liquid-liquid exchange in instances where capital cost savings can be demonstrated.

CONSTRUCTION

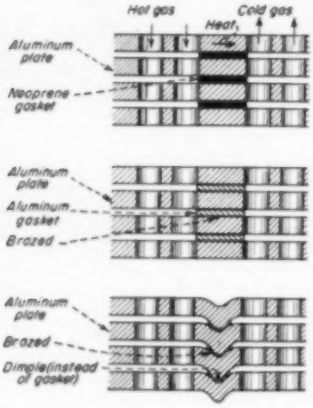
Building a perforated plate exchanger is fairly simple—hence, the hope for inexpensive units. Present methods of building units will probably be modified (some new ideas are already being tried). But it may be best to describe the building of the large (illustrated) exchanger first.

The exchanger was designed for an oxygen unit and is really a double exchanger. The top portion is a cold exchanger, the bottom part a warm exchanger. At the bottom is an aluminum header casting which guides the air and nitrogen to their respective passages. Then thin, punched aluminum plates and neoprene gaskets are alternately piled until some 700 plates have been put in place. Then comes another cast aluminum header which guides the nitrogen and air into their respective channels for the cold exchanger section; above that, another cast aluminum header which guides an auxiliary high pressure air stream to its channels. Then aluminum plates and neoprene gaskets are alternately piled again, some 380 plates. Finally a top, cast aluminum header guides the three gases into their exit pipes.

The unit is held together by means of rods running from bottom to top, held under tension with springs. In assembly, four removable I-beams guide



Test units, like that above, are being used to test new gasket ideas that should simplify construction. The above unit has been dip brazed.



ORIGINAL DESIGN Uses neoprene gaskets to establish channels through pile of plates. Requires spring loading to make seal (see drawing previous page).

FIRST IMPROVEMENT Uses aluminum gaskets instead of neoprene. Brazing eliminates spring loading, may cut 55 percent from cost of original.

SECOND IMPROVEMENT Ridges, or dimples, pressed right into perforated aluminum sheets, eliminate gaskets entirely, may cut cost to 38 percent of original.

Gasket improvements under test (left) will simplify construction, cut costs.

the building up of plates and gaskets, assuring alignment.

In size, the unit is no peewee experimental exchanger. It is 9 ft. high, 3 ft. across, and 7 in. deep. It is designed to handle more than 3,000 lb. per hr. of air.

The A. D. Little engineers have a hatful of ideas to simplify construction and reduce the cost of these units. The first of these is to replace the neoprene gaskets with aluminum gaskets and braze the whole exchanger together by dip brazing. That would eliminate the need for the tie-rods and springs. A. D. Little engineers feel that would cut the cost of the oxygen plant exchanger described above by 55 percent. It would also cut the weight by 38 percent.

A second idea involves dip brazing, too, but eliminates the gaskets entirely. Here, the individual plates would be ridged along the line of separation of gas passages. These ridges (see illustration) would then be dip brazed together. The Arthur D. Little engineers estimate that this would cut the cost to 68 percent of the neoprene-gasket exchanger and reduce the weight by 44 percent.

There are many other possibilities and a wide variety of other gasket materials may be used.

ADVANTAGES

The A. D. Little engineers see many advantages for their type unit compared to conventional fin-tubed exchanger or the other, fancy designs being used for oxygen units. Here are some of them:

1. If the unit needs cleaning or is corroded, it can be disassembled in the field, plates cleaned or replaced, rebuilt, and put back into operation. This is not true of brazed units.

2. There are few metal limitations. Most of the other types require brazing which limits the metals that can be used.

3. Longitudinal heat transfer is minimized, particularly when neoprene gaskets are used. Even in the brazed cases there is a minimum of such heat transfer.

4. The unit is relatively cheap, occupies small space, is light, reduces headering problems to a minimum, has high heat transfer capacity per unit space occupied, can be assembled in the field.

5. It requires small investment for the exchanger manufacturer and could be fabricated abroad from local material, so that scant dollars would not have to be spent to import equipment from the U. S.

6. Exchangers can be designed for any number of streams, with the number changing through the length of the exchanger as desired.

7. If an existing exchanger is transferred from one service to another, you can change the length easily by adding or subtracting plates, or the number of passages by putting in different gaskets. This supposes a non-brazed unit.

DESIGN

Designing a perforated-plate heat exchanger is a relatively easy job—if you are familiar enough with the units to make the proper initial assumptions.

After considerable experimentation, the results of which were reported this month to the American Society of Mechanical Engineers, the Arthur D. Little engineers determined the plate and gasket characteristics which are most important in design. The following things must be known, or specified, before design can start: volume of gas flow per unit time, type of gas and its properties (specific heat, viscosity, density, etc.), temperature of the gas in and out, log mean temperature difference between the heating and cooling streams, and the allowable pressure drop. Both sides of the exchanger (heating and cooling) must be similarly specified, of course.

Next, the designer must pick his general specifications for the unit—and here is where experience counts. The designer must choose the hole diameter for the punched holes in each plate, how many holes there will be per unit plate area and the punching pattern. Channel widths must be picked, and also plate thickness and gasket thickness.

Having picked these things, the design is worked out mathematically, based on five formulas. The first of these is the Fanning friction equation. The second relates mass flow to the dimensional specifications of the unit. The third relates the heat transfer factor, j, to the mass flow. The fourth deals with fin efficiency, as does the fifth.

It is perhaps best to illustrate the heat exchanger design by an actual

example. Suppose it is desired to heat 10,000 lb./hr. of air from 70 to 200 deg. F. The log mean temperature difference is 10 deg. F., the mean specific heat of the air is 0.24 Btu./(lb., deg.F.) and the allowable pressure drop is 2 psi.

The A. D. Little engineers, based on their experience, would pick the following dimensions: hole diameter, 0.084 in.; spaced on 0.125 in. centers with a staggered, delta pattern. Channel widths would be ½ in., plate thickness would be $\frac{1}{16}$th in., and gasket thickness would be 0.022 in.

Now the things to be determined are (1) the cross-section of the plates, the number of plates required, and the fin efficiency. Here, then, are the general formulas that apply to any case, and the specific results of the above example. No attempt has been made to derive the basic equations, or show where they come from. These are just the "working" equations used in design.

1. Pressure drop, based on Fanning Equation

$$\Delta P = \frac{2fLG^2}{\rho g d}$$

But, $L = m\,l$

$$\therefore G^2 = \frac{\Delta P \rho g d}{2fml}$$

Determine f from chart.
Unknowns: G, m.

2. Mass flow

$$G = \frac{M}{nwlq}$$

Unknowns: G, n, l.

3. Combine (1) and (2)

$$m = \left[\frac{\Delta P \rho g d w^2 q^2}{2fM^2}\right] n^2 l^2$$

Unknowns: m, n, l.

4. Heat transfer

$$j = \frac{N^{2/3}h}{G}$$

Determine j from chart.
Unknowns: G, h.

5. Combine (4) and (2)

$$nl = \frac{Mj}{wqN^{2/3}h}$$

Unknowns: n, l, h.

6. Fin efficiency (simplified equation)

$$\eta h = \frac{2Q}{A_s \Delta T_m}$$

But, $A_s = mnlwdx\iota$

$$\eta = \frac{2Q}{mnlwdx\iota\Delta T_m h}$$

Unknowns: η, m, n, l, h.

7. Fin efficiency

$$\eta = \frac{\tanh\left(\frac{hxdsz}{ky}\right)^{1/2}}{\left(\frac{hxdsz}{ky}\right)^{1/2}}$$

Note: fin height (x) is ½ channel width (w).
Expand into a series:

$$\frac{\tanh z}{z} = 1 - \frac{z^2}{3} \text{ (additional terms are negligible)}$$

$$\therefore \eta = 1 - \frac{hxdsz}{3ky}$$

Unknowns: η, h.

8. Combine (7) and (6)

$$\frac{2Q}{wrdx\iota\Delta T_m mnlh} = 1 - \left(\frac{xdsz}{3ky}\right)h$$

9. Combine (8) and (5)

$$\frac{(2Qq\,N^{2/3})}{(rdx\iota\Delta T_m Mj)\,m} = 1 - \left(\frac{xdsz}{3ky}\right)h$$

10. Combine (8) and (3)

$$\left(\frac{2Qq\,(\Delta P \rho g d)^{1/2}}{Mrdx\iota\Delta T_m\,(2fl)^{1/2}}\right)\frac{1}{m^{1/2}h} = 1 - \left(\frac{xdsz}{3ky}\right)h$$

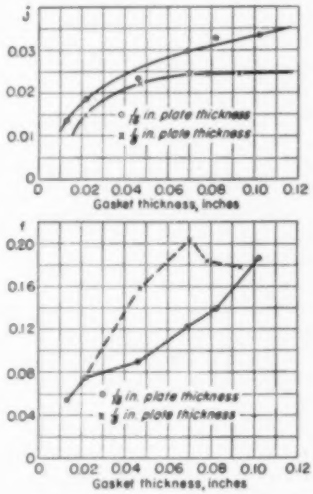
11. Combine (9) and (10)

$$mh^2 = \frac{\Delta P \rho g d j^2}{2fl\,N^{4/3}}$$

12. Equations (11) and (9) can now be solved simultaneously (best by trial and error) for m and h.

13. The value of nl can now be calculated from (8). Note that these equations do not produce a solution for n and l individually. Hence, choose reasonable figures for these two quantities which will give a well-proportioned exchanger.

In the actual example given above, the necessary quantities are shown in the nomenclature table. Solving eqs. (11) and (9) gives a heat transfer coefficient (h) of 73 and 401 as the number of plates required. The product of the number of channels and their length (nl) solves as 42.7. It would then seem reasonable that 14 channels, each 3 ft. long would do the job.



The above charts give the heat transfer factor, j, and the friction factor, f, based on the gasket thickness. These figures can be used with Reynolds numbers from 500 to 2,000.

It should be remembered, of course, that the above only solves one side of the exchanger—in this case, the heating side. A similar calculation has to be run on the cooling side to complete the exchanger design.

The charts given here for determining f and j are based on results from experimental work done by A. D. Little on heating and cooling air. They appear to be reasonable figures to use on most other gases. The main purpose for including the design calculations is so the reader can tentatively check the value of this exchanger against other types when he has a particular application in mind. Any such calculation will at least indicate whether or not the Little exchanger will bear more extensive investigation for that application or not.

In conclusion, the author would like to acknowledge the assistance of Howard Hamacher, H. O. McMahon and others of the Arthur D. Little staff who supplied the information on which this article is based.

NOMENCLATURE

		Quantities Used in Example
A_s	Heat transfer surface, sq. ft.	
d	Hole diameter, ft.	0.084/12
f	Friction factor, dimensionless	0.08
g	gravitational conversion factor, (lb. mass) (ft.)/(hr.²) (lb. force)	(32.2) (3600)/(3600)
G	Mass flow of gas, (lb.)/(sq. ft.) (hr.)	
h	Heat transfer coefficient, (Btu.)/(hr.) (sq. ft.) (deg. F.)	
j	Heat transfer factor, dimensionless	0.0173
k	Metal heat conductivity, (Btu.)/(hr.) (sq. ft.) (ft.)/(deg. F.)	125.5
l	Length of each channel, ft.	
L	Length of the total number of holes, ft.	
m	Number of plates	
M	Gas flow, (lb.)/(hr.)	10,000
n	Number of channels	
N	Prandtl number, dimensionless	($N^{2/3}$ = 3.3)
P	Pressure, (lb.)/(ft.²)	
ΔP	Pressure drop, (lb.)/(ft.²)	288
q	Fraction open area on a plate	0.404
Q	Heat transfer rate, (Btu.)/(hr.)	312,000
r	Number of holes in a plate per sq. ft.	10,656
s	Number of holes per fin height	2
t	Plate thickness, ft.	1/(16) (12)
T	Temperature, deg. F.	
ΔT_m	Log mean temperature difference, deg. F.	10
w	Width of each channel, ft.	0.5/12
x	Fin height, ft.	0.5/(12) (2)
y	Fin width, ft.	0.040/12
η	Fin efficiency, dimensionless	
ρ	Gas density, (lb.)/(cu. ft.)	0.077

Editorial Viewpoints

SIDNEY D. KIRKPATRICK and Staff

Lessons for the West

Looking back on two pleasant and stimulating weeks spent on the Coast last month, we feel constrained to temper our praises with a bit of well intended criticism. At the risk of appearing ungrateful for the friendly and generous hospitality of our California hosts, we wonder if they are really well advised in holding the Pacific Chemical expositions and industrial conferences in San Francisco at two-year intervals.

This year's show, it seemed to us, lacked much of the vigor and enthusiasm that characterized its predecessor. Attendance at the conferences was discouragingly small despite attractive programs with timely subjects handled by speakers of national reputation. There were many empty booths at the exposition and those in charge reported lack of interest on the part of their relatively few visitors. By far the most popular exhibits were in a booth featuring laboratory animals and biological supplies. Next in apparent interest were the regional and educational exhibits sponsored by governmental organizations.

In spite of San Francisco's strategic location, half way between the chemical industries of southern California and those of the Pacific Northwest, we found many in favor of alternate sites for future shows. Los Angeles is prepared to make a strong bid for the next one, perhaps three to five years hence. Seattle, Tacoma or Portland will be ready when their turns come. And all with whom we talked recognized the benefits that might accrue if these expositions were tied in with national meetings of sponsoring organizations such as the American Chemical Society or the American Institute of Chemical Engineers.

The remarkable growth and continuing progress of the Pacific process industries is an achievement in which all of us are proud to have had a share. We cannot afford to do anything that will jeopardize or retard that development. But we are confident that those who have its best interest at heart will make certain that the West works out a better balanced plan and program for serving the needs of its chemical and process industries.

Orderly Proceeding Sought

The use of pest control chemicals leaves residues of toxic material on certain fruits and vegetables. The result may be, without suitable precautions, that some of the toxic material remains in the food when it is ready to eat. Food and Drug Administration is now undertaking to find out to what extent and how it may control this in the interest of protecting the public health.

First announced is a public hearing beginning on January 17 to determine the tolerances which should be set for such deleterious substances remaining on fresh fruits and fresh vegetables. Later will come comparable inquiries with respect to processed fruits and vegetables. All of this represents a large undertaking of great public importance and also possible serious burden on chemical and food companies.

It is fortunate that Food and Drug Administration has decided to request a simplified and orderly presentation by appropriate scheduling of witnesses in accordance with the subjects on which they will testify. This will, it is hoped, make effective adequate record of the proceedings easily possible without use of excessive time or development of needless controversy.

Chemical companies are deeply concerned in this matter, if at any time they have any part in the supply of the chemicals which are involved. Such companies should do all that they can to assist the presiding officer in this case to keep the proceeding within the bounds of reason.

Neither the public nor our industry will gain from anything but the most direct orderly proceeding. Each of us should exert his influence in that direction.

Official Warning Given

Investigation of Donora air pollution in the "unusual smog episode of October 1948" presents chemical enterprise with one of the most comprehensive documents and an official warning of great importance to every engineer and process industry executive.

The Donora case was studied thoroughly by a group of U. S. Public Health Service specialists assisted by the Weather Bureau. The report constitutes a large quarto volume of about 175 pages. As a compendium of methods of study of atmospheric poisoning and a discussion of both facts and theories, the book is a striking one. No one interested in air pollution should ignore this "epidemiology of the episode at Donora, Pennsylvania." (The book is issued as Public Health Bulletin No. 306, available from Government Printing Office at $1.25.)

But more important in the long run than the worth-

while technical material are the categoric official findings of the Surgeon General of Public Health Service: "The Donora report has completely confirmed two beliefs we held at the outset of the investigation. It has shown with great clarity how little fundamental knowledge exists regarding the possible effects of atmospheric pollution on health. Secondly, Donora has emphasized how long-range and complex is this job of overcoming the problem of air pollution—after we get the basic knowledge on its effects."

The Surgeon General also emphasizes in this unusual case that ". . . it was not until the tragic impact of Donora that the nation as a whole became aware that there might be a serious danger to health from air contaminants."

One must infer that the zealous government investigators are expecting to make quite a career of the air contamination problems of industry. One should not question the propriety of this, even its necessity. But at times there appear in this report and in other activities of Washington some effort to develop a campaign against enterprise which looks less justified. We trust that the highly professional practices of Public Health Service are not perverted into efforts of zealots seeking greater appropriations and findings to be used for political purposes. The public can be protected, and should be, without such excessive zeal.

Chemicals in Foods

None of the hubbub in Washington over hazards to the public from use of chemicals in foods has any justification in fact. Possibilities of the sort described have always existed. But there is not one shred of evidence that the public health has been risked in the slightest by the desire to improve foods with chemicals.

The formulation of bread with chemical additives has gone on carefully and constructively. As far as we can learn, none of the companies interested in promoting the chemicals as emulsifiers, softening agents, or anti-staling additives, has carelessly or inappropriately made these changes without due scientific and toxicological investigations.

We are not surprised that columnists like Drew Pearson, as well as some members of Congress, have been led by these trade controversies to think that some serious hazard exists. But we do believe that these individuals should have been more careful in the things they have said in the daily papers and in the halls of Congress. Even casual inquiry would have disclosed that the charges which have made by them are wholly untrue in fact.

All this has in it one little moral which all chemical enterprises can well note. It is evident that the careful advances which have been made with the utmost attention to questions of public safety have not been adequately publicized. More attention might well have been given to educating the housewife as to how it is now possible altogether safely to make bread seem and actually be more like fresh bread for a longer interval. Had the housewife been so advised, the recent hubbub would have been laughed down quickly. Meanwhile all who intend to promote the use of chemicals for any purposes affecting the general public can find important lessons here.

Fuel for Western Enterprise

Dow's aggressive, sales-minded president, Leland I. Doan, sold a bill of goods in his keynote address before the recent Pacific Industries Conference in San Francisco. He reminded a distinguished group of western financiers and industrialists of the important fact that something more than originality and aggressive operation are necessary to build their new processing and consumer goods industries. Beyond the many technical problems involved is the need for new venture capital—for men with money who are willing to risk it freely in backing the right combinations of western resources and inventive brains.

Chemical industry will be able to provide the West with more products and more jobs, according to Mr. Doan, "only so long as men with savings have an incentive to let us use those savings. And they will have that incentive," he added, "only so long as they have the hope for profit and the right to profit from our operations."

In contrast with conditions under which many older industries were able to grow and prosper he said: "We have somehow permitted too many segments of our population to get the warped idea that capital is a bad thing and that corporate profits are either completely unwarranted or should be subject to governmental control." This resentment to capital, no matter what its cause or origin must be corrected. And the job can best be done by each individual company, within the family of its own employees, wherever it may be.

"Here we are," Mr. Doan declared, "not only the best producers but the best salesmen in the world, with the best piece of merchandise the world has ever known, with the best educated and most intelligent over-all group of customers. They have had, on the whole, a long and very satisfactory demonstration. What we need is to point out to them, simply, frankly, repeatedly, what they have learned from that demonstration—what they have gained not only in dollars but in human benefits as well."

The problem posed by Mr. Doan's brilliant address is certainly not peculiar to the West alone. It is one all American industry must face if it is to accept the challenge of the times. Nor is it a problem to turn over to some national organization to operate by remote control. It can best be solved in our own companies and in our own communities.

FOR
CHEMICAL ENGINEERING ACHIEVEMENT
HONORING
CELANESE CORPORATION OF AMERICA
THE WALDORF-ASTORIA DECEMBER 1, 1949

Congratulations Celanese!

The occasion: Presentation of this year's Award for Chemical Engineering Achievement. Celanese accomplishments in integration were honored by nearly 1,000 chemical engineers December 1 at New York's Waldorf-Astoria.

PRESENTATION OF AWARD

ALFRED H. WHITE, *Chairman, Committee of Award*

Our committee has had presented to it a challenging array of reports describing processes developed and brought to full-scale fruition in these last five years.

Let me remind you that this Committee of Award is composed of all professors who are in charge of the departments of chemical engineering of the 54 colleges accredited by the American Institute of Chemical Engineers. These men have thorough theoretical training and also mature experience in evaluating difficulties which must be overcome in developing a chemical process and bringing it to successful plant operation.

Our country leads the world in the process industries. If it were possible to list all of the recent worthy achievements in this field the roll of honor would carry many names.

The company which this year has been placed first has been a pioneer in the process industries for a quarter of a century. It has assembled a noteworthy staff of experts and has consistently supported them with wisdom and with courage. It has not been chance, but progressive management and an enthusiastic staff which have brought this distinction.

Mr. Blancke, it is an honor and a privilege to present on behalf of the committee, this 1949 Award for Chemical Engineering Achievement to the Celanese Corporation of America.

ACCEPTANCE OF AWARD

HAROLD BLANCKE, *President, Celanese Corp. of America*

In accepting this Award for Chemical Engineering Achievement in the name of our company, I feel a deep sense of gratitude for this recognition of the patient devoted effort of the many men and women of Celanese who, over a long period of time, successfully integrated "chemical engineering into the whole of a large and diversified organization." On their behalf, Professor White, I thank you for the honor your committee has bestowed upon us.

As I understand the terms of the Award, it is made in recognition of the accomplishments of Celanese Corporation of America made possible by bringing chemical engineers into broad participation in the affairs of the company. At first glance it may appear unusual to some that this Award for Chemical Engineering Achievement was voted to a company popularly considered essentially a textile manufacturer. Celanese yarns, it is true, are sold in textile markets but their production is principally a matter of chemical engineering.

By the fundamental nature of our operations, we have an unparalleled opportunity to use the talents of the chemical engineer in nearly all phases of our business, and I can state that we not only use the abilities of the chemical engineer in important specialized assignments, but we also apply the principles of chemical engineering to the general conduct of our business. Consequently, we appreciate the recognition of this fact by the committee in making the award for the first time to this branch of the process industries.

The chemical research and engineering endeavors of the brothers, Drs. Camille and Henry Dreyfus, resulted, among other things, in the formation of our company as the first large scale producer in this country of cellulose acetate yarn. The aggressive spirit of research and discovery instilled by our founders has been carried on, resulting in continuing improvements in our processes for the manufacture of chemical yarns, plastics and industrial chemicals and the creation of new ones.

Much has been written and said of a group effort. Sometimes the subject is treated as though group effort were new or largely untried. Yet the fact is that group effort is as old as civilization itself. We believe that material progress in our modern world is more than ever dependent upon the purposeful effort of integrated groups of scientists. I am certain that every chemical engineer present here tonight will agree that his profession offers unusual opportunities for the success of group effort.

As a result of such group effort carried on over a long period of time, our company in 1945 brought into operation a plant at Bishop, Tex., to produce on a large scale a variety of industrial chemicals by the direct oxidation of hydrocarbons. This was not only a major achievement of which we are very proud, but I understand, was also a primary consideration by the committee in granting this award.

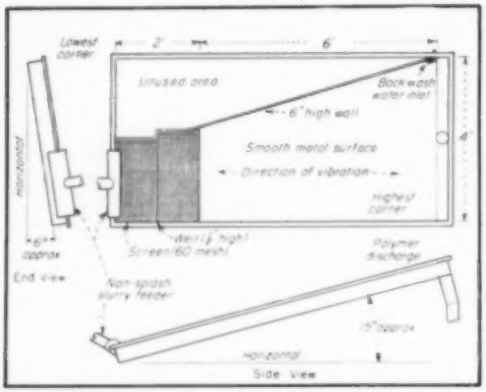
The management of our company shares with you the conviction that the men and women who have applied the principles of chemical engineering to the development of our company are worthy of the distinction which this award confers.

Through their continued broad participation in the affairs of our company, we hope to enjoy with them the satisfaction of contributing to the welfare of mankind.

Our esteemed chairman, Dr. Camille Dreyfus, sincerely regrets that he is unable to be with us here tonight. We of Celanese wish that he were here to share with us this honor which all of us know would have been impossible to achieve without his inspired leadership through the years. In his absence Dr. Dreyfus has asked me to read you his personal message: "We are very grateful to the founders and administrators of this award and thank also the eminent educators and scientists who voted this award be given to us. It will be one of the most enviable, brightest and cherished feathers in the cap of Celanese."

The Plant Notebook

THEODORE R. OLIVE, Senior Associate Editor



Modified Vibrating Screen Serves As Tilted Table Dewaterer

W. P. STEVENSON, *Polychemicals Dept., E. I. du Pont de Nemours & Co., Arlington, N. J.*

★October Contest Prize Winner

In the course of the development of an improved continuous process for the washing and drying of granular Teflon tetrafluoroethylene resin, a novel dewatering unit was perfected. This piece of equipment is basically a standard vibrating screen unit to which both slope and tilt have been applied, and to which a stream of water is fed as an aid in dewatering. It is a relatively inexpensive unit, and there is some possibility that it may also have application for other similar specialized uses. The attached sketch indicates the surface layout of this device and the directions of the slope and the tilt.

Before describing the operation of the tilted table dewaterer, it will first be necessary to mention some of the characteristics of the polymer which made commercially available equipment unsuitable for this service. Basket centrifugals and the various cake-forming filters were ruled out primarily because it was found that polymer which had been centrifuged as a stationary cake would, on standing, discharge more water. This feature can be attributed to the particle structure which apparently holds up water in cavities in the irregular particle surfaces. Inasmuch as Teflon is not wet by water and is free draining, a vibrating screen offered the type of continuous particle motion which would be likely to shake the water drops out of the cavities.

However, ordinary screens were found to be relatively unsatisfactory because any water which did not pass through the screen at the point of slurry feed formed small water bubbles of up to ¼ in. diameter. These bubbles were covered with fine particles and could not successfully be broken up by baffles, weirs, or beating. The removal of the bubbles was further complicated by the fact that very fine polymer particles formed a sort of film on the screen every place where a stream of water was not washing them off, effectively transforming the major portion of the screen into a solid surface.

In further experimentation, it was noticed that the polymer-covered water bubbles would not travel up as steep a slope as would the solid particles; but, when attempts were made to feed at reasonable rates, the granular polymer carried the bubbles up the screen by sheer force of numbers. This observation then led to the application of tilt as well as slope to the vibrating surface in the hope that, while the polymer would travel straight up the surface, the bubbles would fall off to the low side where they could be separately collected. With some minor modifications, this unit operated successfully.

The dewatering action of this tilted table dewaterer is, of course, based on the inability of the water bubbles to travel straight up the steep slope which will convey the solid particles. Consequently, a solid metal sheet was used to replace the screen wherever the polymer film would have made it useless, in order to insure that an equivalent amplitude of vibration would be available across the whole operating surface. In operation, the slurry is fed to the screen at the feed end of the unit where most of the loose water is drained off. The polymer and water bubbles then travel up the vibrating surface, after passing over the weir which acts as a distributing device. That is, the solid particles travel parallel to the direction of vibration as shown in the accompanying sketch, while the water bub-

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★NOVEMBER PRIZE WINNER—A $50 prize will be issued to . . .

MARSHALL NAUL
Chemical Engineer, Roscoe, Ohio

. . . for an article on a method of finding stoppages in distilling columns, which does not require drilling holes in the column, or other permanent changes. This article has been judged the winner of our November contest. It will appear in the January Plant Notebook.

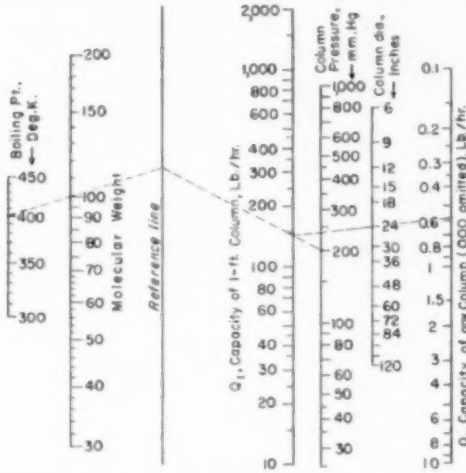
$50 PRIZE FOR A GOOD IDEA—Until further notice the Editors of *Chemical Engineering*, will award $50 cash each month to the author of the best short article received that month and accepted for publication in the Plant Notebook.

The winner each month will be announced in the issue of the next month, e.g., the December winner will be announced in January and his article published in February. Judges will be the Editors of *Chemical Engineering*. Non-winning articles submitted for this contest will be published if acceptable at usual space rates.

HOW TO ENTER CONTEST—Any reader of *Chemical Engineering*, other than a McGraw-Hill employee, may submit as many entries for this contest as he wishes. Acceptable material must be previously unpublished and should be short, preferably not over 300 words, but illustrated if possible. Articles may deal with any sort of plant or production "kink" or short-cut that will be of interest to chemical engineers or others in the process industries.

Also, novel means of presenting useful data, as well as new cost-cutting ideas, are acceptable. Address Plant Notebook Editor, *Chemical Engineering*, 330 West 42nd St., New York 18, N. Y.

bles fall off to the low side where they are assimilated by the back-wash water stream and returned to the feed end. There, the water drains off through the screen and the recovered polymer again travels forward, proceeding to the discharge hopper.


Boiling Pt., ← Deg. K.
Molecular Weight
Reference line
Q1, Capacity of 1-ft. Column, Lb./hr.
Column Pressure, ← mm. Hg
Column dia., Inches
Q2, Capacity of any Column (1,000 omitted), Lb./hr.

Nomograph for Capacity of Distilling Column

E. G. E. Land and D. Ormston, *British Industrial Solvents, Ltd., Hedon, Hull, England.*

Both in pilot plant work, where the same column may be used for the distillation of a number of compounds, and in estimation work prior to detailed design for large scale plants, the nomograph given here has proved valuable. Knowing the molecular weight and boiling point of the compound to be distilled, and the operating pressure of the column, the chart gives the capacity in lb. per hr. for a 1-ft. diameter column operating with a vapor velocity of 1 ft. per sec. The chart also incorporates a correction scale for column diameters larger or smaller than 1 ft. For other vapor velocities, the capacity is directly proportional. That is, the capacity Q_1 for a 1-ft. diam. column, operated at 1 ft. per sec., times the actual vapor velocity = the actual capacity of a 1-ft. column, while the capacity Q_2 of a column of any other size, operated at 1 ft. per sec., times the actual vapor velocity = the actual capacity of a column of the size in question.

These problems will make use of the nomograph evident: Determine the capacity of a column 2 ft. in diameter, operated at 2 ft. per sec. vapor velocity, when used for a material of 100 mol weight with a boiling point of 400 deg. K., using a column operating pressure of 200 mm. Hg. Align $M = 100$ and $T = 400$ to intersect the reference line. Align this point with $p = 200$, cutting Q_1 at 141. Align Q_1 with diam. = 2 to give $Q_2 = 564$. Then $Q = Q_2 \times 2 = 564 \times 2 = 1{,}128$ lb. per hr.

A problem useful in estimating a large scale plant is as follows: Find the diameter of column necessary to produce 744 lb. of distillate per hr. with a reflux ratio of 2 to 1. The molecular weight is 110, the boiling point 350 deg. K., the operating pressure 70 mm. Hg, and the vapor velocity 4 ft. per sec. Now, the total boil-off will be $3 \times 744 = 2{,}232$ lb. per hr., and Q_2 will be the boil-off per unit of vapor velocity, or $2{,}232/4 = 558$ lb. per hr. Determining Q_1 from the nomograph as in the first case gives $Q_1 = 62$ lb. per hr. with a vapor velocity of 1 ft. per sec. Joining the values of Q_1 and Q_2 on the chart then gives the necessary column diameter, or 3 ft. on the diameter scale.

The nomograph is based on the perfect gas law relation, $PV = RT$. Assuming a vapor velocity of 1 ft. per sec. for a 1-ft. dia. column, the capacity Q_1 is given by the relation $Q_1 = 2.82(M/T)p$. For the general case $Q = 2.82(M/T)pD^2U$, where Q is lb. per hr., M is molecular weight, T is boiling point in deg. K., p is operating pressure in mm. Hg, and U is vapor velocity in ft. per sec. Because of the generally unsatisfactory nature of the equations at present in use, these expressions have not taken into consideration the pressure drop in the column, and hence the loading and flooding points.

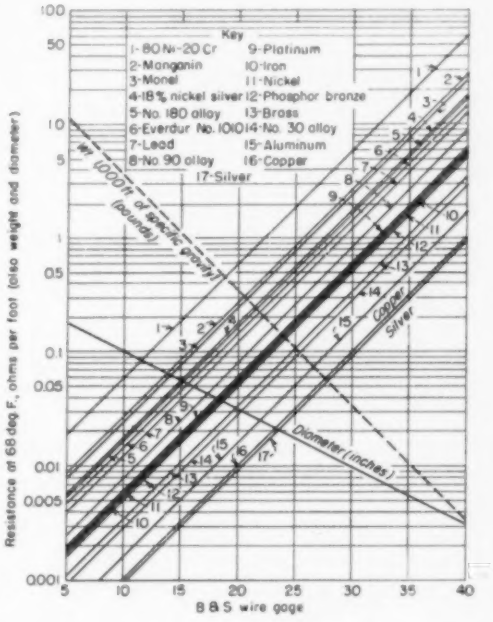


Chart Simplifies Recording of Wire Resistance Data

Joseph T. Hogan, *Chemical Engineer, New Orleans, La.*

Often in experimental design a knowledge of the electrical resistance of various metal and alloy wires is required of the chemical engineer. Data on the electrical properties of materials are generally scattered throughout the literature and various handbooks and quite often the designer spends much time searching through files of material for relevant information on a specific material.

Stannard (*J. Optical Soc. of America*, **15**, 65, July 1927) prepared a wire table in which he presented the electrical properties of various metal and alloy materials expressed in metric units, in which form physicists and scientific workers find it applicable to their needs. To comply with standard engineering practice and units, however, con-

version factors are necessary for transposing the data to the engineering units of measure.

To assist the designer and engineer and to make available electrical data on various metal and alloy wires, the accompany plotted "wire table" is presented. The resistance in ohms per foot is given for 17 metals and alloys for wire sizes ranging from Nos. 5 to 40 B. & S. gage. The data have been assembled from various sources such as handbooks and manufacturers' catalogs. No effort has been made to make the table exhaustive in content. However, a few comments on its construction will assist the reader to add additional data easily as desired.

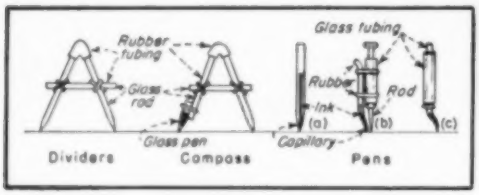
It will be noted that 1,000 times the resistance of No. 20 ga. wire is numerically equivalent to the specific resistance in ohms per circular-mil-foot. All lines representing resistance versus B. & S. gage numbers are parallel to the copper line. Thus, to plot the data for any other material, all that is required is its specific resistance. Plot the specific resistance divided by 1,000 as a point on the No. 20 ga. line and draw through it a straight line parallel to the copper line. In fact, since data for copper wire are usually given in all handbooks, the copper line can be drawn as shown in the graph and the straight lines for other materials drawn as described, with only the value of the specific resistance required for the operation.

To convert specific resistance in ohms per circular-mil-foot to microhms-cm., multiply by 0.1662.

One line on the chart gives the diameter in inches of each gage. The weight in pounds of 1,000 ft. of wire of specific gravity 1.0 is also included as one line. This permits calculation of the weight of wire of any material if the specific gravity of the material is known, simply by multiplying the chart value by the specific gravity and proportional length.

As an example, what is the resistance, weight and specific resistance of 200 ft. of No. 30 ga. iron wire?

From the graph, No. 30 ga. iron wire has a resistance of 0.61 ohm per foot. Then 200 ft. has a resistance of $0.61 \times 200 = 122$ ohms. Also, 1,000 ft. of No. 30 ga. wire of specific gravity 1.0 weighs 0.035 lb. since iron wire has a specific gravity of 7.7, then 200 ft. weighs $0.2 \times 7.7 \times 0.035 = 0.054$ lb. The resistance of No. 30 ga. iron wire is 0.061 ohm per foot. Multiplying 1,000 gives a specific resistance of 61 ohms per circular-mil-foot for iron.



Emergency Drafting Tools Easily Made From Glass

GEORGE TATOIAN, *Chemical Engineer, Naugatuck, Conn.*

Chemical engineers and chemists sometimes find themselves without the necessary drafting tools when graphs or drawings have to be made. If there is a laboratory handy, the tools can easily be made from glass rod and tubing, and bits of rubber tubing, as the sketches show. These are largely self-explanatory. Glass rod can easily be drawn to a point for compass and dividers. With the compass either a pencil or a glass capillary pen can be used. A satisfactory pen is made by drawing a glass tube to a capillary. Pieces of rubber tubing, or rubber bands, serve as suitable connectors. Among the several pens shown, sketch (a) represents a drawing pen, (b) a drop spring bow pen, and (c) a contour pen.

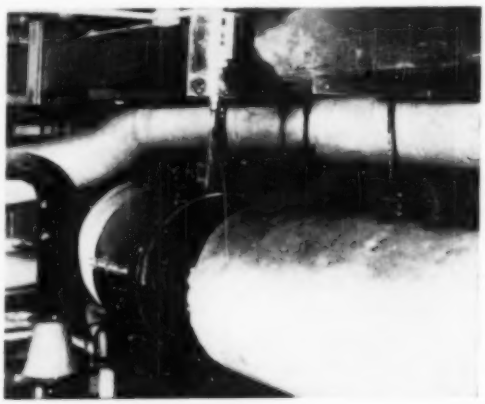
Improving Efficiency of Extraction In an Edible Oil Refinery

HENRY HARMAN, *Chemical Engineer and Superintendent, Cía Industrial "La Unión" Canete, Peru.*

In our cottonseed oil plant we use hydraulic presses for extraction, then refine the crude oil by the usual caustic soda treatment, followed by bleaching with activated earth. We were concerned by the losses of oil in the filter cake resulting from the filtration of the oil from the earth. Oil content of the cake ran as high as 50 percent and only a small part could be recovered by steam blowing.

We hit on the idea of feeding this filter cake to the extraction presses, charging the material by hand into the cake formers to avoid contaminating the cottonseed meal. This recuperated 80 percent of the oil formerly lost. Recovered oil mixes with the crude and so recycles to the refinery.

In using 0.4 percent of activated earth for bleaching the refined oil, this method reduces loss in filtration from 0.4 to 0.1 percent, which in our plant represents an extra yield of 60 lb. per day. At present prices this means quite an attractive proposition.



Insulate Pipe Supports to Reduce Heat Losses

The view above shows a method of pipe support developed by the Sargent & Lundy engineering organization, from test work conducted at the University of Illinois. Its purpose is to reduce heat losses by conduction through the pipe supports, such as occur when the support is attached directly to the pipe. The method is to provide a saddle carried by the support which is large enough to distribute the load safely outside the insulation. For example, for the 85 percent magnesia on which the tests were conducted, a loading capacity of 10 lb. per sq. in., or 100 lb. per running inch of line has been established. In the installation shown the support consists of a 10-ga. plate rolled to fit the insulation and flanged for installation, carried on a ⅜-in. saddle plate tack welded to the lower half. The usual hanger strap is bolted around the entire assembly.

Designing a Robotized Plant for Resin Glue Production

The problem of designing fully automatic, push-button process plants is more complex than ordinary plant design—but it is coming! Here is a fairly simple example

A. BROTHMAN and R. V. RAMANI

NOTE: *This is the second of two articles by these authors on fully automatic plants for chemical processing. The first, on page 114 of our November 1949 issue, dealt with the economics and general design considerations of "robotization." To make the application of the principles more evident, the present article offers a rather detailed discussion of the design of one such plant. For those who may soon find it desirable to undertake similar projects, the time needed to digest the article thoroughly will be amply repaid.*—EDITOR.

IN THE earlier article of this series we treated the "robotization" of process plants in a general way, going into questions of advantages, performance characteristics, economics, costs, and the design factors that affect the engineering of such schemes. We noted, fo example, that the problem can usually be solved largely through the addition of interlocking devices, and that in most cases the ordinary control instrumentation that would be used in a well designed conventional plant will be adequate, or nearly so. Additional cost, therefore, runs at most to only a few additional percent of total installed plant cost. We noted too that the interlocks serve the necessary functions of tying together and sequencing the various parts of the process, supervising the instrumentation, and assuring safety to personnel, plant and product.

Considering the various sorts of process that may be robotized, it was brought out that there is no limit on the type of process that can be so handled, but that continuous processes are least complex, batch processes somewhat more complex, and batch-continuous processes the most complex when it comes to fully automatic operation. It also became evident that, although there can be no simple, direct "system" for robotization, still there is a sort of unity of over-all approach which is not too difficult for the engineer to grasp, once he has had some experience in this field.

Because robotization is not simple, and demands a thorough integration of many branches of engineering, it seems best to depart from general considerations and get down to a specific example. If the solution to the problem presented here does not prove applicable directly to any of the specific needs of the reader, it will still show him how each phase of the problem is handled and take him a long way toward the sort of thinking which will be directly usable for his own purposes.

Limitations on space and the reader's patience make it necessary to gloss over some phases of the complete design, but we shall endeavor to touch on all the most instructive aspects of the control, sequencing and interlocking of the various process steps in a small batch plant making an aqueous solution of urea-formaldehyde resin, intended for cold-setting plywood glue. The plant uses a standard aqueous solution of formaldehyde which is reacted with urea crystals under suitable conditions of temperature and pH to form a mixture of methylol-urea and dimethylol-urea. This mixture is then put through the proper schedule of temperature and pH conditions to bring about a polycondensation reaction, and produce a solution of urea-formaldehyde resin of desired average molecular weight. Vacuum "flash" dehydration to a desired concentration completes the process after the reaction has been stopped by pH adjustment.

A flow diagram of the process appears in Fig. 1, while the complete robotization diagram is given in Fig. 2. As a key to the process, Table I gives a schedule of operations and lists and discusses the special conditions and operating hazards which must be met in making the process results completely reproducible from batch to batch. Such a table is a sound starting point for any robotized plant development. As a key to the easier understanding of the interlock system, Table II shows against each item of the schedule (Table I) the prime signal associated with that operation, the interlock components bringing the signal about, the qualifying conditions involved in the signalling, and the interlocks that impose these conditions.

In Fig. 1 the mixture of methylol-urea and dimethylol-urea is prepared in reactor E3, while the polycondensation to urea-formaldehyde resin and the eventual partial dehydration of its water solution take place in reactor E7. Since it is desirable for the plant to be able to run alternatively at one-third, two-thirds or full rated production capacity, E3 is made large enough to provide methylol-urea and dimethylol-urea sufficient for three cycles of operation of E7, permitting any of the three production rates to be carried out. Hence the batching of raw materials to E3 must be adapted to the preparation of three batch sizes of one-third, two-thirds and full capacity of E3, while E7 will run either one, two or three cycles for each cycle of E3.

FORMALDEHYDE BATCHING

The first operation according to the schedule of Table I is the delivery of a proper batch of formaldehyde from the formaldehyde storage tank E1 to the reactor E3. In accomplishing this automatically, in accordance with the desired alternative production capacities, it is desirable that certain conditions be placed on the operation of the equipment used for this purpose. These conditions include: (1) ascertaining that a proper supply of formaldehyde is in E1; (2) being certain that a correspondingly adequate supply of urea crystals is in the hopper E2; and (3) assuring ourselves that E3 has discharged its previously prepared batch and is ready for the

A. BROTHMAN *heads the consulting firm of A. Brothman & Associates, Long Island City, N. Y.* R. V. RAMANI *is associated with Seshasayee Bros., Ltd., Trichinopoly, South India.*

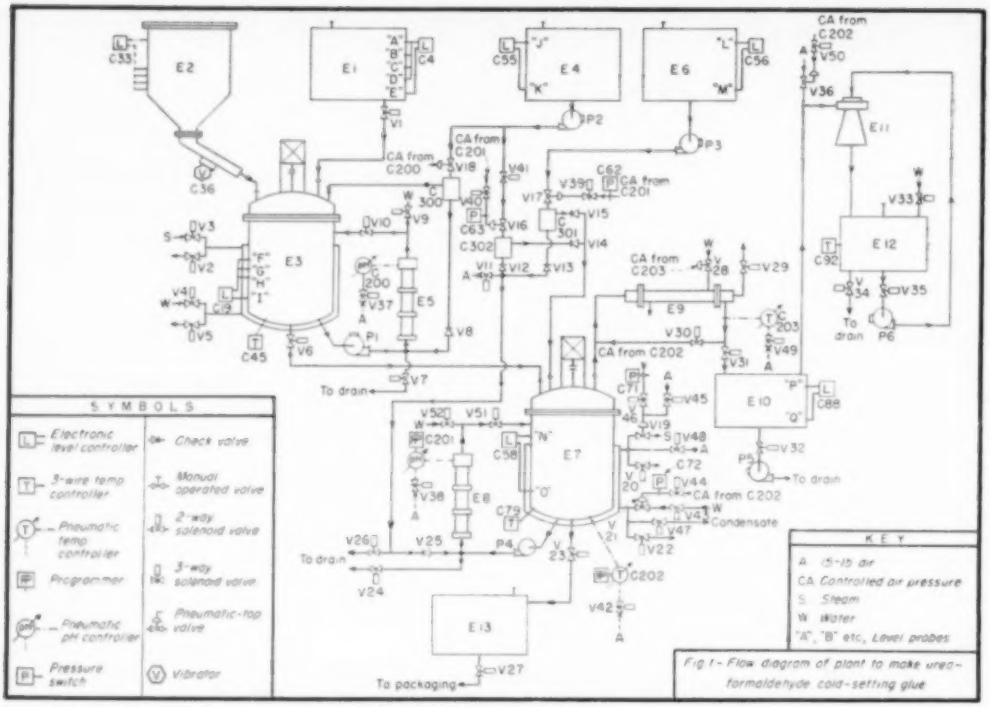


Fig. 1—Flow diagram of plant to make urea-formaldehyde cold-setting glue.

preparation of a new batch of materials.

The main constituents of the interlock system which accomplishes charging of formaldehyde to E3 (while still performing the necessary checks) comprise the level switches C4 and C19, the level device in E2, and the mechanically held relays and timing relays of which C24 and C47 are, respectively, typical. To facilitate the description of the circuits involved here, we will describe briefly these main constituents.

The level switches C4 and C19 are of the type which is responsive to high and low levels in a tank, in a coordination which involves: (1) the continuous emission of a signal from tap "3" of the switch, for a period beginning with the baring of a probe connected to the "low" tap of the switch, and ending with the immersion of another probe which is con-

Table I—Schedule of Operations

I. Preparation of monomeric mixture of methylol-urea and dimethylol-urea.

A. Batch out formaldehyde from E1 to E3. This operation must be designed to permit operation at one-third, two-thirds or full capacity.

B. Batch out urea from E2 to E3. Same batching conditions as in *A* above.

C. Carry out reaction to form methylol-urea and dimethylol-urea. This is to be done at 30-35 deg. C. and a pH of 8.5 to 9.0 for 15 hr. This pH range must be held against a tendency of the reaction system to slip by itself to the acid side.

D. Signal readiness of batch in E3 for conversion to the urea-formaldehyde condensation product resin solution. This involves signalling E7, the reaction vessel, into operation in such a way that, through repetitive cycling of E7 and its accessories, the contents of E3 will be exhausted.

II. Conversion of mixture of methylol-urea and dimethylol-urea to a 70 percent solids content solution of urea-formaldehyde resin in water.

A. Batch material from E3 to E7.

B. Adjust pH of contents of E7 to 4.8±0.1-0.0 at temperature as charged. In operations *C* and *D*, pH must be held sharply at 4.5±0.1. After temperature is raised in operation *C* a final adjustment to pH 4.5 is needed.

C. Raise temperature to 95 deg. C. at a programmed and rapid rate; reaching this temperature in 10 min., but not in less than 10 min., is critical.

D. Maintain the system under reflux at 95 deg. C. for 20 min.

E. Adjust pH of reacted batch to 7.0±0.1. Accuracy in attaining this pH is important in stopping the glue-forming polycondensation reaction at the desired level of average molecular weight. Failure to accomplish this within 3 min. requires the most rapid possible cooling of the batch. This pH must be controlled for the rest of the cycling of E7.

F. Start vacuum dehydration of the batch. To do so the pressure in the system is reduced to 4 in. Hg abs. at maximum rate consistent with prevention of frothing. This pressure reduction is accomplished by "flashing" water vapor from E7 to E9. On condensing the vapor so flashed, the condensate is dropped to E10 for intermittent discharge to drain. This assumes that emergency cooling of the batch has not been carried out as in *E*. Concerning frothing: this phenomenon depends to a great extend on slight batch-to-batch variations in viscosity which will not affect product quality. Frothing is therefore variable.

G. Continue vacuum dehydration at 4 in. abs to desired water take-off.

H. Drop finished batch to product storage vessel E13.

I. Repeat cycle from II-*A* through II-*H* on successive charges from E3 to E7 until total batch prepared in E3 is exhausted.

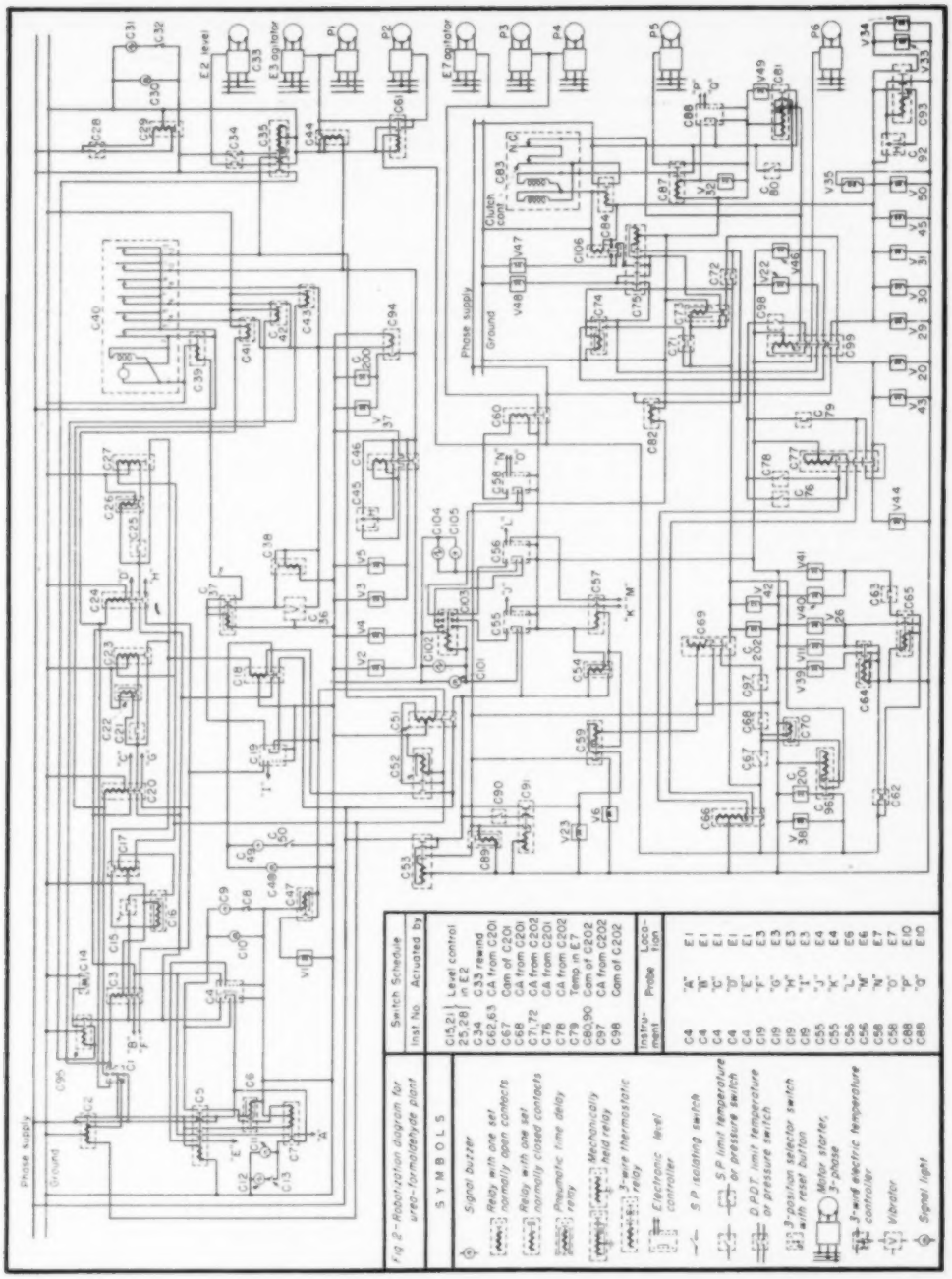


Fig. 2–Robotization diagram for urea-formaldehyde plant, with interlock wiring. Diagram is to be read in conjunction with Schedule in Table I and Key in Table II.

Table II—Key to Robotization Diagram, Fig. 2

Schedule Item No.	Source of Prime Signal	Effective Interlock Train	Interlock Combination Imposing Conditions on Prime Signal	Remarks and Notes
I-A	C1—1/3 capacity	C19, C47, V1	C4*, C24, supply detection in E1; C4, C24, C25, C26, C27, C18, supply detection in E2	C4, C9, C10, low supply detection in E1; C2, C4, C5, C6, C7, C11, C12, detection of level, anticipating the necessity to refill E1
	C1—2/3 capacity	C19, C47, V1	C4*, C20, supply detection in E1; C4*, C20, C21, C22, C23, C18, supply detection in E2	*Power to C4 is, in this instance via C2 and C3 (in its de-energized position)
	C1—full capacity	C19, C47, V1	C4*, C3, supply detection in E1; C4*, C3, C15, C16, C17, C18, supply detection in E2	
I-B	C19—1/3 capacity	C37, C39, C40, C41, C36	C19*, detection of completion of formaldehyde filling of E2 to 1/3 capacity	*C19 receives power by way of C18, as a result of the engagement of C18 by a signal delivered from C27, or C23, or C17
	C19—2/3 capacity	C37, C39, C40, C42, C36	Ditto (2/3 capacity)	
	C19—full capacity	C37, C39, C40, C43, C36	Ditto (full capacity)	
I-C (a) Start agitation	C40—Tap 10	C44	C44, assures agitation during urea addition	
(b) Start pH Control	C40*—Tap 10 C40**—Tap 10 C40†—Tap 10	V37, C200 C44 C44	C94, detection of completion of urea charging None None	*This interlock associated with setting C200 into operation **This train establishes the operation of the recycle pump P1 †This train sets P2 into operation
(c) Start temperature control	C40—Tap 10	C45, C46, V2, V3, V4, V5	None	
I-D	C40*—Tap 12 C40**—Tap 12 C19†—Tap 3	C51 C35, C33 C51, C2 C17 or C23 or C27 C52, C51 C52, C18	C35, C95, C14, assure disengagement of brake in level device of E2; C34, C35, limit on rise of level device C52, assures that C18 is the last to be disconnected C47, assures that V1 does not give unscheduled performance	*This interlock train signals E7 into operation **This interlock re-positions the level device in E2 †This interlock sequence re-sets the interlock system affecting E3 for its next scheduled performance
II-A (a) Batch material	C51	C55, C103, C56, C58, C59, V6	C54, C57, assure that a proper supply exists in E4 and E6; C54, C59, re-setting of train to V6 for the next cycle of E7	
(b) Start agit. of E7	C58—Tap 5	C60	C58, assures prior proper charging of E7	
II-B	C58*—Tap 5	C60		*This train sets P4 into operation
	C58**—Tap 5	C60, C61		**This train establishes a bypass for the continued operation of P2 after E3 is empty
	C58†—Tap 5	C60, V38, C201		†This train sets C201 into operation
	C58††—Tap 5	C60, V38, C201	C67, C68, C97, C69, check on proper pH in E7 before heat-up of batch in E7; C67, C70, C96, means of discontinuation of clock member of C201 until check of C67, C68, C69, C97 is completed; C69, C96, means of completing check	Application of C201 to acid feed C62, C64, V39; flushing, on switching to caustic feed, C62, C65, V11, V26; application of C201 to caustic feed, C62, C65, C63, V40, V41; flushing on switching back to acid feed, C62, C64, V11, V26 ††This train checks on the actual pH in E3 before beginning Operation II-C

nected to the "high" tap of the switch; and (2) the continuous emission of a signal from tap "5" of the switch for a period beginning with the immersion of the "high" probe, and ending with the baring of the "low" probe. In the case of C4, the alternative connecting of the "high" tap of the switch to any one of four probes, "A," "B," "C," and "D," renders the switch alternatively responsive to the detection of five level conditions, including: (1) a level anticipating the necessity to refill E1; (2), (3) and (4) levels needed for full scale, two-thirds and one-third plant capacity production; and (5) by the baring of the "low" probe, the full exhaustion of the tank's contents. In the case of C19, the alternative connecting of the "high" tap of the switch to any one of three probes, "F," "G," and "H," renders the switch responsive to the detection of the levels which correspond to the three alternative plant production capacities.

The level device in E2, which measures the quantity of urea crystals in that vessel, consists of a braked motor with a pulley-drum attached to its shaft. A weight is suspended from the end of a wire rope wound on the drum. When the solenoid-operated brake is released, the overhung weight falls, rotating the drum, and comes to rest on the urea crystal mass. A tripping nub in the wire rope actuates the limit switches in the path of travel, thereby indicating the level of the urea mass. Limit switches C21, C15, and C25 are so located as to signal urea levels lower than that required for full, two-thirds, and one-third capacity production.

The mechanically held relays that constitute important interlock circuit components described in this article have, as will be observed from Fig. 2, two-section solenoids. A permanent magnet principle is employed so that an impulse signal through one section of the coil engages and holds it in that position until a reversing impulse reaches the other section. The timing relays used are of the pneumatic dashpot type, familiar to most readers.

Returning now to that portion of the interlock system which attends to the charging of E3 with formaldehyde solution, the three-position selector switch C1 is the means used in setting the production capacity of the plant at any one of the three possible production capacities. Let us assume that the plant is to be run at its one-third capacity level. Throwing C1 to its "one-third capacity" position and pressing the reset button member of C1, results in the engagement of the mechanically held relays C2 and C24. The engagement of C2 leads, by way of one of the normally closed sets of contacts of the now disengaged C5, to the application of phase to the phase tap of the level switch C4, while the engagement of C24 results in connecting both the probe "B" to the

Table II—Key to Robotization Diagram, Fig. 2, continued

Schedule Item No.	Source of Prime Signal	Effective Interlock Train	Interlock Combination Imposing Conditions on Prime Signal	Remarks and Notes
II-*C*	C60	C69, C202, V42	C67, C68, C97, check on previous attainment of proper pH in E7	Application of control to steam flow through C71, C74, C99, V46, V47; flushing on switching to cooling, C71, C73, C75, V48, V47; switching of control to cooling, C71, C73, C72, C99, V44, V43, V20; flushing on switching to heating, C72, C75, C74, C75, V48 and C74, C99, V22
II-*D*	C60*	C69, C202, V42	None	Same as II-*B* *This train maintains control on the jacket of E7
	C80**	C81, V49	C98, C99, V29, V30, V31, assure that V29, V30, V31 are in position for refluxing	**This train establishes the coordinated functioning of E9 with E7 for refluxing
II-*E*	C58—Tap 5	C60, V38, C201	C76, C77, sequence interrupter for period of pH check; C79, C77, C66, means of interrupting C202 program for period of check; C79, C77, V30, V43, emergency application of cooling, if pH is not right; C78, C77, re-establishment of normal sequence of operations on attaining proper pH	Same as II-*B*
II-*F* (a) Switch C202 to Vac. control	C98	C99, V50, V36	C99, V45, full open steam to jacket of E7; C99, C106, V47, condensate valve opening	
(b) Start Vac. system	C98	C99, P6	C99, V35, opening suction P6; C99, C92, C93, V33, V34, maintaining of limiting temperature in E12; C99, V29, V30, V31, switching of these valves to dehydration position	
II-*G* (a) Measure condensate	C98* C88**	C99, C84, C83, C88, C87 C87, V32, P5	Starting of II-*F* operations	*This train "locks in" the condensate measuring equipment **This train provides for the intermittent discharging of E10
(b) End Vac. dehyd'n	C83*	C99, V29, V30, V31, V35, V45, V50, C92, C93, V33, V34, P6	C88, C87, C83, detection of reaching sufficient dehydration	*This train disengages all operations involved in vacuum dehydration
	C83**	C81, V49		**This train discontinues the operation of E9 for the rest of E7's cycle
II-*H* (a) Empty batch to E13	C90	C91, V23	C58, C59, V6, prevent unscheduled filling of E7 from E3 after emptying of F7 is over	
(b) Reset interlock system	C58*—Tap 5	C60, E7 agit., P4, P3		*This train discontinues the operation of the agitator and P4 and P3
	C58**—Tap 3	C82†, C75 C89, C53	C89, provides for signal from tap "3" of C58 to survive disengaging of C91 by holding up the disengaging signal for C53	**This train disengages C53 which functions as a sustaining signal for the last signal of E7 after E3 is totally discharged †C82 re-sets C75
II-*I* (a) Re-signal operation proper	C51	C53 and/or C51, C55, C54		
(b) Re-set V6 circuit	C54	C59	C51 or C53, and C54, makes re-setting of V6 circuit dependent on a repeated signal from E3	

"high" tap of C4, and the probe "H" to the "high" tap of the level switch C19.

Application of phase to the level switch C4 and connection of its "high" tap to the probe "B" in E1 is the means which ascertains that a sufficient supply of formaldehyde for one-third capacity production is present in E1. Connecting the "high" tap of C19 to the probe "H" in E3 is ultimately the means of filling E3 with a charge adequate for one-third capacity production. If we assume that there is sufficient formaldehyde in E1 for the desired capacity of production, a phase signal would be emitted from tap "5" of C4. This signal would then be applied, via one of the load contacts of the already engaged C24, to the interlock train represented by the level switch C25, the timing relay C26, and the mechanically held relay C27.

Meanwhile, the same signal from C4 would be relayed across C95 to the phase side of the solenoid-operated brake of the level device in E2. The signaling of C14 and the engagement of the C25-C26-C27 train brings into action that section of the interlocks which has the job of ascertaining whether E2 contains a sufficient supply of urea crystals to permit the further progress of all charging operations to E3. The signaling of C14 sends the level device in E2 into the fall, thus determining the level of crystals in E2. If enough crystals are present in E-2 for the desired one-third capacity production, the level switch C25 will remain in its normal closed position. Since the relayed signal from tap "5" of C4 is applied simultaneously to the limit switch C25 and the actuating solenoid of the "on-delay" relay C26, the possibility of an accidental transmission of the signal downstream from C25, due to a delay in the fall of the level measuring device in E2, is prevented. The delay here is sufficient to assure that the level device has "gone home."

At the expiration of the delay period for C26, the relayed signal from the downstream side of C25 is applied to the engaging section of the mechanically held relay C27. The engagement of C27 means completion of the check on the quantity of urea crystals in E2. An insufficient supply of crystals would, of course, cause the opening of C25 and a consequent failure to engage C27.

One additional condition on the charging of E3 remains to be imposed, namely, that no charging can be done if E3 is not empty. A study of the interlocks will show that: (1) if E3 still contains previously prepared material, the necessary "empty" signal for formaldehyde charging will not originate from tap "3" of C19; and (2) without the complete discharging of E3, the disengagement of C2 and the consequent re-setting of the master switch will be impossible. Thus,

(*Continued on page 290*)

Chemicals—Backbone of Italy's Recovery

Over-all economy gets a shot in the arm as Italy starts to fill markets vacated by the fall of the German chemical empire

Northern Italy, suffering the least war damage, leads in chemical rehabilitation.

KARL FALK

One of the chief hopes in Italy's over-all recovery program is its chemical industry. War set-backs are almost a thing of the past. Italy is now in a good position both at home and abroad to help fill the gap left by the virtual elimination of German chemical production. Short on raw materials but long on manpower and capacity, the closely-knit industry should, with an even break in domestic and international developments, be able to better its relative position as a world producer and trader in chemicals.

United States interest, aside from two billion dollars already granted in food and relief supplies, one-half billion in ECA recovery aid, and Export-Import Bank loans, is heightened by the fact that Italy, though still not a large factor, showed the greatest percentage increase from 1938 to 1948 of any American chemical export market. In 1948 Italy, for instance, was the largest importer of U. S. drugs. Excepting for a time in the 30's, United States has always been Italy's principal supplier but has not taken an equal amount of Italian goods in return. Growing financial and technical collaboration of U. S. firms with Italian chemical industries, especially in the petroleum, plastic, and synthetic fiber fields is further evidence of interest.

Factors pointing toward a favorable development in chemicals for Italy include the existence of a well-integrated modern industry based on available raw materials, ability to ship to dollar-short Mediterranean, Near East, and South American markets from whom she needs goods in return, positive plans for research and agricultural and industrial expansion by 1952 with ECA and Italian government aid, tax reform projected for 1950, and the possibilities opened up by the newly proposed Franco-Italian customs and economic union, which should extend Italian markets considerably.

Unfavorable factors include shortage of imported raw materials, uneven distribution of domestic raw materials, lack of capital, high production costs and prices, unemployment, a burdensome and complex tax system, uneven recovery from war damage, the relatively low Italian standard of living which means that chemical capacity outruns chemical consumption in some fields, and unbalanced trade abroad, as well as unstable economic and political conditions in countries with whom Italy normally expects to trade. Germany, which formerly took one-quarter of Italy's exports and supplied one-fourth of her imports, is being replaced by Argentina as a general export market, however.

Italian statistics—never noted for

KARL FALK, *who covered continental Europe for* Chemical Engineering *from 1932 to 1937, is now head of the social science department at Fresno State College, Fresno, Calif. Dr. Falk's field of specialization is international chemical economics.*

their accuracy—give some idea of the degree of postwar recovery. Early in 1949 chemical output was about 85 percent of 1938, as against 40 percent in 1946 and 20 percent in 1945, the two lowest years in Italian chemical production and export. Prewar levels are being exceeded in basic chemicals, sulphuric acid and caustic soda production, while fertilizer and insecticide output was around 95 percent of 1938. In branches where production is far below capacity—less damaged by the war than might be expected—the cause is sooner to be found in a lack of demand for chemicals (for instance by the Italian synthetic fiber industry) than in a shortage of chemical producing capacity.

Montecatini (Società Generale per l'Industria Mineraria e Chimica, Milan), dominant factor in the Italian chemical industry, has shown a healthy recovery since the war. Its plants in industrialized northern Italy were generally less damaged than those of central and southern Italy. Montecatini accounts for roughly 90 percent of Italian pyrites output, 80 to 90 percent of Italian nitrogenous fertilizers, 70 percent of sulphuric acid, 70 percent of insecticides, 60 to 70 percent of phosphatic fertilizers, 60 percent of dyes, 50 percent of aluminum, 45 percent of plastics, and about 33 percent of sulphur. In addition, the firm generates and consumes about 5 to 10 percent of Italy's hydroelectric power.

After showing a net loss in 1945, Montecatini has shown steady recovery and profits since 1946. Its capitalization has increased from 2 billion Lire in 1942 to 4 billion in 1947, with an increase to 8 billion planned to aid in future developments.

ANIC (Azienda Nazionale Idrogenazione Combustibili), established jointly by Montecatini and the government, is planning with Standard of New Jersey to restore and build a new hydrogenation works at Livorno and petroleum refineries at Bari to process Near Eastern crude oil. By 1952, when Marshall Plan aid is supposed to see the countries of Europe on their feet again, Italy hopes to be producing 3.4 million tons a year of refined petroleum products, scheduled to be one of her biggest export items.

Prospecting for domestic petroleum at greater depths, chiefly in northern Italy (Lodi, Piacenza, Ferrara, Rovigo and Padua) is also planned. Early results are encouraging, especially in natural gas discoveries connected with petroleum prospecting. Larger amounts of methane have been found to be available than was formerly believed. Arrangements are being made to produce and distribute by pipeline this substitute for Italy's deficient coal and liquid fuel, which is already being used more extensively as a fuel, carburant, illuminant, and chemical raw material. The American-Italian Methane Co. is furnishing technical collaboration in developing the north Italian reserves. Anglo-Iranian Oil, Royal Dutch Shell, Sinclair Refining and Petroleum, Caltex Oil Products of N. Y., and MacMillan Oil are a few of the other foreign firms participating in oil plans. Favoring foreign private investment is a tendency to lifting restrictions such as that passed in 1942 that foreign capital could not be a major part of an Italian firm and to removing onerous royalty levies on methane output, for instance.

IS ITALY I. G. FARBEN TO BE?

Montecatini has resumed or initiated collaboration with foreign groups in other fields, notably with French interests (Rhone-Poulenc) in rayon and pharmaceuticals; British (Courtaulds) in rayon, (ICI) in plastics, and also in margarine; with the Belgians and Dutch in synthetic fibers and ammonia; Swiss in aluminum and hydroelectric developments; U. S. firms (Du Pont) in plastics and nylon; (American Cyanamid) in nitrogen and plastics; (Vanadium Steel Co.) in vanadium alloys. German I. G. Farben formerly held 49 percent of ACNA (Aziende Colori Nazionali Affini, Milan), dye and plastic producing Montecatini subsidiary, which has reportedly had difficulties since the interruption of the flow of raw materials and intermediates from Germany. Under the new Franco-Italian program to go into effect in 1950 French firms may step into the breach along with other foreign groups. In this connection it is of interest to note that in their technical journals the Germans themselves feel that Montecatini is the best-equipped chemical concern in Europe to take over the position I. G. has had to relinquish. German firms, incidentally, are advertising extensively in "La Chimica e l'Industria" and other Italian technical publications, offering to supply especially chemical equipment and installations to Italy. Whether Montecatini steps into I.G.'s shoes depends a lot on developments elsewhere, but the firm, along with the rest of the industry, does have the possibilities, know-how, manpower, and some of the raw materials to do so.

Italy, it will be remembered, is woefully short of coal—90 percent has to be imported—and oil, and likewise has to import coke and coal tar products, phosphate rock, potash, carbon black, cellulose, cotton linters, and many of its pharmaceuticals. It does, however, have abundant hydroelectric power in the north, and good supplies of salt, pyrites, sulphur, mercury, bauxite—considerable part of the Istrian deposits were lost to Yugoslavia—marble, talc, asbestos, lead, zinc, antimony, and low-grade lignite, and it has available the byproducts of the olive, grape, and citrus fruit industries. The country on the whole can produce the equivalent of 80 percent of its minimum consumption requirements. The remaining 20 percent—and this corresponds roughly also to chemical raw materials—has to be imported.

Because of the shortage of raw materials in Italy, emphasis in the chemical and allied industries has been on synthetic products. Synthetic fibers have long been a big export item. Nearly half the Italian synthetic fiber output was exported in 1948. In 1925 Italy furnished 16 percent of world output of synthetic fibers. By 1939 it supplied 14 percent, and by 1948 accounted for only 6 percent of the world's production of synthetic fibers. To overcome the need for imported cellulose in prewar days the Italians worked extensively with casein, wheat straw, rice stalks, and reed, and are now trying hard to develop domestic sources and to establish mutual trade with cellulose exporting countries.

Since the war Italian synthetic fiber industries, which were scarcely damaged during the war, have recovered steadily. Though below prewar and wartime levels, rayon production has recovered much faster than staple fiber (rayon 47,700 tons in 1948, staple 22,000). A 60 percent expansion by 1952 is anticipated. Three million dollars worth of rayon and other synthetic yarns were included in Italian exports of chemicals to U. S. in the first half of 1948. Rodioacetu (part Montecatini) is to sell its whole output of rayon acetate to U. S. manufacturers in 1949 and 1950 against the purchase of American rayon and spinning machinery. Snia Viscosa (linked to Courtauld's), largest Italian synthetic fiber manufacturer, is reported negotiating to build a plant in Alabama to use artificial fibers as a substitute for natural furs in plush manufacture.

Domestic dyestuff consumption is, of course, closely related to synthetic fiber production. The Italian dye industry is planning to raise output to

22,000 tons by 1952, of which it is hoped about 10,000 tons will be exported. Plastic production, though still low, is expanding rapidly, and is to be upped nearly 50 percent by 1952 to 32,000 tons, of which 2,000 is earmarked for export. The number of plastic plants has doubled to 800 since 1939, when 20 percent of output was exported. In 1947, of an 18,000 ton production (half phenolic), 8,000 tons was exported. Both the plastic and dye industries are dependent, however, on imported raw materials. Italians are trying to improve quality, specialize, and modernize production. The importance of plastics in steel-short Italy is illustrated by the fact that the big Terni and Rumianca steel concerns are planning to undertake plastic production.

PHARMACEUTICALS BOOMING

The 800 chemical-pharmaceutical plants employing 20,000 persons cannot supply domestic demand except in sera and vaccines. Farmitalia (Montecatini) plants were not damaged in the war and are working closely with the French Rhone-Poulenc interests. They have been operating at capacity except when slowed down by a recent strike of Italian chemical workers, and have increased sales at home and abroad for pharmaceuticals, especially to treat tuberculosis and other pulmonary diseases. With U. S. and Danish aid, domestic penicillin production is being undertaken.

In the immediate postwar period primary emphasis was on restoring and expanding fertilizer and basic chemical production to boost agricultural output. As a predominantly agricultural nation, Italy needs to increase output with better farming methods, land reclamation and irrigation, and more extensive use of agricultural chemicals. Nitrogen capacity—about one-third was damaged during the war—is expected to reach 175,000 tons by the end of 1949 (largely Fauser process), 210,000 by 1950, and to exceed 300,000 tons by 1952. With a production then of about 200,000 tons there should be an exportable surplus. Formerly an importer, Italy last year was a net exporter of about 50,000 tons. Production of nitrogenous fertilizers in 1948 was over 100,000 tons, under the 1941 peak but above prewar levels. It is interesting to note that one of the big prewar developments calling for the production of Fischer-Tropsch motor fuel from lignite at Valdarno has been switched instead to building a nitrogenous fertilizer plant with a capacity of 50,000 tons of nitrogen per year.

Montecatini, with about 50 superphosphate plants, some quite modern, using the Montecatini-Bellinzoni continuous process, has been exchanging Italian pyrites for French North African phosphates. Wartime damage had reduced capacity by about one-fourth, but by 1947 prewar levels of superphosphate production had been reached again. Current output of about 200,000 tons P_2O_5 content is to be raised to 300,000 tons by 1952, with an exportable surplus expected. Potashes have had to be almost wholly imported in the past, chiefly from Germany.

Sulphuric acid output is above prewar levels again, with several new plants recently placed in operation. 1947 production of sulphuric acid was in the magnitude of 650,000 tons, with an increase to 1.4 million tons projected by 1952. Although the quality of Italian pyrites is declining, the supply should continue to be adequate to fill domestic needs and leave an exportable surplus. Montecatini has about 60 sulphuric acid plants, mostly chamber process, but also has a few very modern contact plants. Before the war Montecatini had seven copper sulphate plants and was the world's largest supplier of copper sulphate and second largest pyrites producer. Total Italian production of copper sulphate since the war has been down because of the lack of copper—two plants were reclaiming copper from cartridge cases—but is expected to reach over 140,000 tons by 1952.

Italian sulphur production, in postwar years down to one-fifth of what it was 40 years ago when Italy was the world's big producer and equivalent to only about one-fortieth of current U. S. production, is handicapped by production costs about treble those in the United States. Nevertheless, with U. S. aid, it is hoped to put the more economical Sicilian mines on their feet again and raise output sufficiently to supply Italian needs for crop dusting and industrial uses and leave a surplus for export to France and Mediterranean countries.

Caustic soda production of 200,000 tons in 1948 (76,000 exported) was above prewar levels. Output of soda ash (chiefly Solvay plants) of 325,000 tons (21,000 exported) likewise was almost up to prewar marks. Calcium carbide production of 165,000 tons in 1948 was over prewar levels despite electric power and coal shortages. As hydroelectric facilities grow, an expansion in electrochemicals is projected. This will also facilitate an increase in aluminum production, now recovered to prewar levels. Output is scheduled to be 114,000 tons by 1953, which is more than double the wartime peak. Help in financing these expansions is partly expected through the state Istituto Ricostruzione Industriale and by trying to interest private domestic and foreign capital.

PAINTS & LACQUERS GAINING

Expansion is also planned in Italy's paint and lacquer industry. Italy has been backward in this field, partly because of the small demand resulting from the general lack of building between wars and partly because of the shortage of domestic raw materials excepting mineral pigments. Synthetic improvements and prospects for gaining Mediterranean and Near Eastern markets are stimulating increased interest in this field. Specialties as citrates and tartrates are still high in price—not quite as high as the general Italian price index which is 50 times above prewar levels—but are finding outlets to traditional and non-dollar markets. Traditionally Italy has supplied trataric acid and borax to France and Belgium, cream of tartar to Great Britain, citrates to France, barium sulphate to United States, and caustic soda to Greece.

The Italian chemical industry will be further stimulated if and when the Franco-Italian customs and economic union materializes. The customs union is scheduled to go into effect in 1950 and the gradual economic union by 1955. This would mean an expanded domestic market, including North Africa, of 100 million persons. Many problems have to be ironed out before such a union can be effective, however. Among them are removal of customs restrictions, quota restrictions, stabilizing currencies, coordination of laws and regulations on pure foods, hygienic and sanitary matters, working conditions, patent laws, providing for free circulation of labor, etc. Representatives of Italian and French chemical industries have already met in Paris to talk over some of these subjects. French proposals in the matter of handling chemical export markets between the two countries are interesting. They have suggested allocation of foreign markets. Argentina, for instance, already Italy's market, would be left to the Italian partners, say the French, while in Mexico, which buys from France, the Italians would agree not to compete. In the case of new and recently industrializing markets, such as India, the French propose that Italy should get this market, while France would get the next available market in turn.

FIRE PREVENTION

For best results, this highly-specialized subject must be given proper attention, not made a step-child of safety. An effective program requires the advice of experts; its most important phase is probably the training of personnel. This report highlights the techniques employed.

CHEMICAL ENGINEERING REPORT—DECEMBER 1949

Fire prevention is becoming increasingly vital in the chemical industry.

Role of municipalities

First of all, as a result of recent serious fires and explosions, there is the possibility that chemical companies in the not too distant future will be required by law to obtain "certificates of fitness" from their municipalities as evidence of having adequate fire prevention programs. Fire chiefs will probably be given more authority and responsibility, and will be experts in this field.

Recent advances in chemical technology are adding to the problems. Among them are the large scale use of such highly reactive substances as fluorine, oxygen, and hydrogen peroxide, and the expanded use of liquefied petroleum gases as fuels.

Expert assistance is required to set up an effective fire prevention program. Enforcement of the safeguards in the program is also necessary. However, the whole effort will be largely wasted unless individuals concerned are effectively trained, as the results will be obtained through the actions of these individuals.

Recognized authorities

This report highlights the techniques now being used to prevent fire in chemical plants. The information comes from recognized authorities, namely: the National Board of Fire Underwriters, Associated Factory Mutual Fire Insurance Company, the National Fire Protection Association, and a leading chemical company. Detailed information may be had by referring to any of their numerous publications.

The report is divided into the following general approaches to the problem: Plant Layout, Specification and Design of Equipment, Handling of Flammable Liquids, Handling of Flammable Gases, Elimination of Ignition Sources, Housekeeping, Control of Chemical Reactions, and Maintenance. The sections on Plant Layout and Specification and Design of Equipment are presented first since fire prevention begins on the drawing board where buildings and equipment are designed and located on the plant site.

Plant layout

The main thought in planning the layout of a plant from the fire-prevention standpoint is to isolate extra-hazardous operations in separate sections of the operating area in order to prevent the spreading of accidental fire or explosion.

Today, most of the equipment for hazardous processes is placed in the open. Operating valves, recording gages, meters, temperature and pressure-recording instruments, are usually housed in a small control building located close to the processes.

In some cases, installation of fire walls may be the most feasible and the best means of separation afforded under the circumstances. When large quantities of exposed flammable liquids are involved, substantial fire walls of brick or reinforced concrete are most desirable. If finished product is stored within an operating building, it should be separated by a fire wall.

It is not good practice to locate hazardous processes in upper stories of buildings unless the building is non-combustible and floors are waterproofed and drained.

Bulk storage of "bad actors" should ordinarily be in a low spot on the plant site. Insurance companies specify safe gallonage within dikes surrounding bulk storage tanks and the safe distance between dikes and operating buildings. There are numerous state laws regulating the amount of explosives within the operating units of explosive plants, and the distance between units.

Layout should be so planned that future expansion will not create congestion and unnecessary risks.

Specification and design of equipment

Recognized authorities

Specification of the proper equipment for use in hazardous processes should be done only by choosing from equipment approved for the job by the various recognized authorities, such as the Underwriters' Laboratories, Factory Mutual Laboratories, the Factory Insurance Association, and the National Fire Protection Association. Chemical companies rely on these organizations, as they cannot possibly undertake all the testing work themselves. The National Electrical Code is used as the guide in the selection of electrical equipment.

Design and construction of reaction equipment such as stills, autoclaves, and other pressure vessels, and closed tankage, is usually in accord with the ASME code for unfired pressure vessels. In addition to pressure tests, this code requires that all welded vessels be x-rayed in order to discover weak joints and prevent ruptures during operation. Minute cracks caused by internal stresses may be detected by magnaflux treatment.

Relief venting

Provision for adequate emergency relief venting should be made in the design of all pressure vessels and distillation equipment presenting vacuum implosion and explosion risks.

The relief device should be as close as possible to the piece of equipment without turns so that the pipe will be less likely to get plugged and so that a trap will not be formed.

Relief valves are subject to becoming corroded and sticking tight, and are often too small and too slow in operation to relieve the vessel contents if something goes wrong suddenly. Therefore a rupture-vent diaphragm should also be installed. Relief of hazardous material within a building creates additional hazards. All relief lines must be extended to the outside of buildings.

Storage tanks

The design of storage tanks for flammable liquids includes considerations of materials of construction, tank thickness, riveted and welded joints. Factory Mutual's bulletin "Storage Tanks for Flammable Liquids" and the NFPA Flammable Liquids Ordnance makes recommendations.

Corrosive liquids requiring special tank lining or tanks made of corrosion-resisting material, require construction equivalent in strength to that for steel tanks.

Dust equipment

Considerations in the design of equipment for handling explosive dusts, such as grinders, conveyors, elevators, and collectors, include dust-tight construction with interior volume as small as practical and construction strong enough to withstand maximum explosion pressures likely from the dust present. Adequate provisions for venting must be made when such construction is not practical.

Bins should be provided with hatches to the outside of the building. Hatches inside a building invite a secondary exposion from the dust kicked up by the force of the initial explosion. Spirals, when used for filling bins, minimize the dust cloud formed.

Building design includes considerations of adequate venting of explosion pressure. Vents are not generally intended to serve as a means of preventing explosions, although in some cases they may be used to retard the development of an explosion or prevent propagation from one section of a plant to another. Roof or wall openings, ventilated sash, fixed sash, scored panes, and light wall panels are used to accomplish this purpose.

Handling flammable liquids

Flammable liquids may be the chief factor in a plant's production, or only one of several materials entering into one or more manufacturing processes. Under any circumstances, the first thought in fire prevention is to devise safe handling of these materials while they are in the plant. Practically all chemical materials or flammable liquids are harmless when confined in closed containers, or during their transportation through pipelines. Their inherent hazard becomes evident when they are placed in open containers, or when spills or leaks occur. Then the degree of hazard is determined by the flammable characteristics of the vapor of the liquid, the quantity of liquid, presence of ignition sources, and layout of the plant.

Closed containers

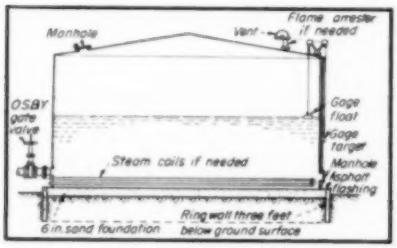
Any closed container for flammable liquid has certain limitations. The rupture of drums or other sealed portable containers may be brought about by mechanical injury resulting

from falling walls under fire conditions, rough handling, impact caused by falling, deterioration of the container from corrosion and subsequent failure, or excessive internal pressure caused by exposure to external heat. Any inside storage should be in properly constructed detached, fire-resistive buildings, or cut-off rooms, which are adequately protected and ventilated. Properly isolated, well arranged outdoor drum storage is frequently more desirable than storage in main buildings because any explosion or fire will be confined to the liquids and will not wreck buildings or equipment.

An attempt should be made to limit, as far as practicable, the amount of drum storage of flammable liquids inside a manufacturing building to one day's supply, regardless of the building construction. Drums should not be stored outside on building platforms or between buildings, or in adjacent locations, for in case of fire they may cause it to spread from building to building.

Discharging containers

The method used to discharge the contents of drums or other containers deserves careful consideration. Any method of discharge such as from faucets into open containers, or any other way exposing the liquid should be discouraged. The safest method is usually by means of a pump, using securely attached and continuous piping or hose lines, although approved self-closing faucets are acceptable in many cases. When flammable liquids are transferred by pumping or pouring, the main supply container and the receiver should be bonded together and effectively grounded. Approved safety cans should be used wherever possible, and the use of glass bottles kept to an absolute minimum.



Typical storage tank. Insertion of a quick-closing valve on the discharge with a pull cable to the outside of the dike is recommended.

Storage tanks

Above-ground storage tanks may be used for storage if they are located sufficiently far from main buildings, properly spaced from each other, and surrounded by dikes where necessary. Both buried and above-ground tanks, not inherently grounded by contact or grounded pipe lines, should be electrostatically grounded, and should be equipped with adequate breather vents protected by approved flame arresters. Detection of leaks and repair is greatly facilitated by constant inspection.

The discharge of flammable liquids from tanks by gravity is very undesirable due to the possibility of the pipe being broken by fire or other accident. However, pumping is impractical in the handling of certain corrosive, highly viscous or highly flammable materials. Under such conditions, it is good practice to use tanks of moderate size and provide each tank with an excess flow valve or with a bottom outlet valve having the working parts inside the tank so that they may be kept cool by the liquid contents of the tank and not damaged if the pipe connection is broken outside the tank. Steel tank supports, protected by a covering of concrete or other insulating material, are able to resist failure from heat. Such protection can prevent additional fire damage. If large quantities of flammable liquids are to be handled, it is desirable to use fixed tanks and pipes rather than portable containers which can never be adequately vented, often leak, and may become incendiary bombs under conditions of fire.

Confining the liquid

To prevent the spread of flammable liquids in case of accidental release, curbs or ramps inside buildings, and dikes outdoors, should be installed to confine the flow. Basins thus formed can be made large enough to confine all the liquid. In order to prevent the overflow and spread of burning liquids lighter than water by water from hose-streams or sprinklers, trapped overflows or drains should be provided, with pipes leading to a safe location.

Ventilation

Where flammable gases or liquids are stored or handled adequate ventilation should be provided. With gases or vapors heavier than air, vents are required at the floor. For gases or vapors lighter than air, ventilation at the ceiling is needed. Localized venting by means of hoods over particularly hazardous operations is highly desirable.

In order to secure adequate ventilation, mechanical means are generally employed. In selection of equipment for this purpose care should be exercised to have it of sufficient capacity so that the lower limit of explosive range of the gas or vapor is never approached. In such cases the amount of air supplied for dilution of the vapors is generally figured to result in a vapor-air mixture with the percentage of vapor being less than one-half that at the lower explosive limit. Exhaust fans should be of the non-sparking type and the vapor-air mixture discharged at a safe location.

Travel of Vapors

Often investigations of fires involving flammable liquids have indicated the cause of ignition of the vapor at varying distances from the sources. Such distant ignitions, often 300 ft. or more, can and do happen. This should be kept in mind when passing on plans for filling or unloading operations.

The use of hazardous flammable liquids may be avoided or reduced by the substitution of relatively safe materials. Carbon tetrachloride, a non-combustible liquid with solvent properties similar and for some uses superior to gasoline, is one of the best known substitutes for gasoline for many solvent uses. A somewhat cheaper solvent, with only a negligible fire hazard, is a mixture of three parts of ethylene dichloride with one part of carbon tetrachloride. When such mixtures are used, care should be taken not to upset the safe proportion. For example, inert solids used with the mixtures may selectively absorb the carbon tetrachloride.

There are also available other solvents, such as trichloroethylene, which while higher in price, for some uses may be desirably substituted for gasoline. Trichloroethylene is non-flammable at ordinary temperatures. Tetrachloroethylene is another non-flammable solvent.

Specially refined petroleum products, first developed as "Stoddard Solvent," and now sold by different oil companies under a variety of trade names, are available with solvent properties approximating gasoline, but with fire hazard properties similar to kerosene. The danger in their use lies in the possibility that persons believing that they are using a safe solvent may neglect ordinary precautions which should be observed with a liquid such as kerosene. When heated to above their flash point, about 100 deg. F., they produce vapors as flammable as those of gasoline at its flash point temperature.

Handling flammable gases

The hazard of flammable gases is generally similar to that of flammable liquids, and many of the precautions apply equally to gases.

Main hazard

Gases are generally confined in closed containers, or piping systems, except where burned or in some special applications. The hazard lies in the possibility of their escape into the atmosphere to form explosive mixtures with air, due to breaks or leaks in piping or containers, or the escape of unburned gas at gas-burning appliances. Vapors from liquefied petroleum gases are particularly hazardous because they settle, forming explosive mixtures quickly.

It is dangerous to extinguish a gas fire and allow the gas to continue to flow, as an explosive mixture may be formed with air which, if ignited, may cause far greater damages than if the original fire had been allowed to burn. The best method of extinguishing gas fires is to stop the flow of gas. Adequate valving to permit easy access is important. Extinguishing the flame by carbon dioxide or dry chemical may be desirable where necessary to permit immediate access to valves to shut off the supply. In many cases, however, it is preferable to allow the flame to continue, keeping the surroundings cool with water spray to prevent ignition of other combustible materials.

Many of the gases used in industry are lighter than air, and hence dissipate more readily than the heavy vapors from flammable liquids. Thus ventilation is a less difficult problem.

The first requirement for the storage and handling of any gas is a substantial piping system and substantial storage containers, free from leaks, strong enough to withstand any pressure to which they may be subjected, and so located or protected as to minimize the danger of mechanical injury.

Transport

Compressed and liquefied gases are transported in steel cylinders and tank cars constructed in accordance with Interstate Commerce Commission specifications as set forth by the Bureau of Explosives of the Association of American Railroads. The containers of varying design, depending upon the character of gas and pressure, are substantially made and are subject to periodic testing to assure their maintenance in safe condition. Large quantities of gas are stored in large steel pressure tanks often spherical in form, or more commonly in gas holders. Gas holders include the familiar floating bell type, where gas is admitted under a gas-tight open-bottom cylindrical container floating in a water seal, and the piston type, where a gas-tight piston floats on top of the gas in a vertical cylinder.

To allow for the operation of gases when heated, closed storage cylinders or other containers are provided with some form of pressure relief to prevent explosion or rupture in case the container is exposed to fire, as this may have far more serious consequences than the escape of the gas into the atmosphere. Provision for relief of excess pressure may be in the form of a disk of metal designed to rupture at a predetermined temperature, or in case of large containers, various forms of safety relief valves.

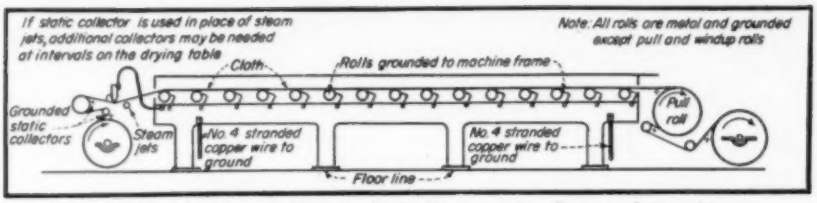
Gas indicators

Combustible gas indicators are a valuable aid in the prevention of explosions. They are of two types, the permanently installed instrument for continuous sampling of combustible gas or vapor in a hazardous area, and a compact portable model for testing gasoline or oil storage tanks, sewers, manholes, ducts, flues and other areas when combustible mixtures are suspected.

Most instruments operate on the principle that rise in temperature of a wire causes a corresponding increase in its electrical resistance. The gas-air sample is passed through a tube containing an electrically heated wire. The gas is burned at the wire and a rise in temperature in proportion to the concentration of combustible gas in the sample imposes a corresponding increase in electrical resistance on the wire. Resistance change is measured by a meter usually calibrated to indicate the proportion of the lower explosive limit. Audible and visual alarms are set to operate at any desired concentration, and relays can be connected to shut down processes, start ventilating fans or release inert gas. A pump supplies the sample for the permanently installed apparatus and a hand aspirator for the portable type.

Instruments are also available which measure gas concentration by measuring the thermal conductivity of the atmosphere being tested and comparing it with the thermal conductivity of pure air.

Since condensation of flammable vapors would cause abnormally low readings, the temperature of the testing equipment must not be lower than that of the area being sampled. This possibility is eliminated by placing the combustion tube in that area. Flame arresters prevent escape of flame from the combustion chamber. Motor and recording instruments not explosion-proof should be installed in a safe remote location. In using the portable tester, however, it is sometimes necessary to conduct the sample to the combustion chamber through a long tube from an otherwise inaccessible area. In such cases, condensation may cause inaccurate readings. A combustible gas indicator must be calibrated for the particular gas or vapor it is measuring and requires careful adjustment and periodic maintenance. Special calibrations are required for gases with low heats of combustion.


If static collector is used in place of steam jets, additional collectors may be needed at intervals on the drying table
Note: All rolls are metal and grounded except pull and windup rolls
Cloth
Rolls grounded to machine frame
Grounded static collectors
Steam jets
No. 4 stranded copper wire to ground
No. 4 stranded copper wire to ground
Pull roll
Floor line

Grounding of spreader machine, showing locations of static collectors and steam jets.

Elimination of ignition sources

Static grounding

Static electricity is a major ignition source. The cheapest and most effective method of preventing static accumulation is to ground the metal parts of a machine to a water pipe or other low-resistance ground.

A single ground wire connected to an all-metal machine at one point, however, may not be sufficient because paint, rust, corrosion or lubricating oil may insulate one part from another.

All metal parts should be bonded together or grounded separately, and revolving metal parts kept clean to avoid insulating effect between the parts and the grounding device. Graphite mixed with the lubricating oil will sometimes serve as satisfactory grounding for revolving parts, but it is safer to provide a grounding brush or wiper which contacts the moving part.

Static electricity generated on materials in processing machines can be eliminated by grounded brass, bronze, or copper wires arranged in numerous sharp points. Tinsel bars or wire

bristles set in metal are the best static collectors. Because collectors are subject to injury or may pick up insulating material when they are in contact with stock-in-process, it is better to separate the collectors from the moving stock a distance of ¼ to ½ in. They should be located not more than 4 to 6 in. away from the point where the stock separates from rollers, guide bars or liner material.

Presence of static at other locations should be determined frequently by a neon-tube tester or other static detecting device.

Belts

Power belts and conveyor belts usually generate static electricity freely; and in very hazardous places it is preferable to use direct drive, metal chain or metal gear drive. If belt drives must be used, the static hazard can be reduced by operating the belts at low speed. Even then, there is danger, and the static electricity must be removed by: (1) applying a dressing which makes the surface of the belt a conductor, or (2) installing a grounded metal comb or collector in contact, or nearly in contact with the belt at the points where it leaves the pulleys.

A new development are belts of conducting material which can be used without belt dressings or static collectors, called static-proof or static-conductive belts. They are available from practically all manufacturers of rubber or fabric belts. As yet, experience with these belts is limited. Therefore one should be periodically tested with a neon-tube tester to determine whether or not it is safe for use in a hazardous location.

Humidification

Humidification is an effective means of preventing static accumulation. With a relative humidity of 50 percent there is little likelihood of unsafe static accumulations, because a thin conducting film of moisture is deposited on most objects which conducts the static charges to ground as fast as generated.

It is the absence of "moisture film" which explains why most static fires occur in the winter, when the indoor relative humidity is low.

Humidification may be obtained by means of steam jets, unit humidifiers, or air-conditioning and ventilating systems. Unless automatically controlled, it should be checked periodically with a hygrometer.

Ionization

Air is ordinarily a non-conductor of electricity, but when "ionized" it contains electrically charged particles and will conduct static charges to grounded parts of the machine. Ionization may be produced by high temperature, by the silent discharge of a high-potential electric current, or by use of radioactive materials.

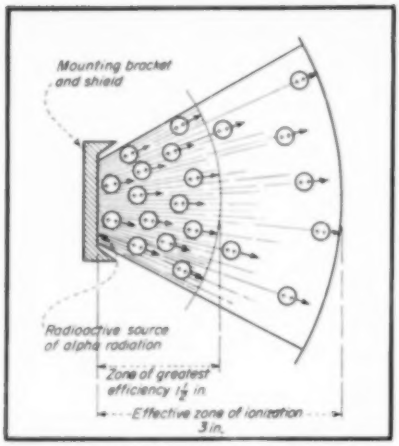
The chief trouble with high-potential neutralizers is that if used with artificial humidification, moisture tends to cause surface leakage of current which gradually builds up until it sparks to ground.

Ionization by radioactive means will probably attain wide usage, since the devices require practically no maintenance, and there is no danger of ignition from electrical current. Although some states have prohibited their use, there is no health hazard involved if simple precautions are followed. It is necessary to shield the source properly.

Worker hazards

In some processes involving volatile flammable liquids it is difficult to prevent accumulation of static electricity on the workers themselves. The human body is a good conductor of static electricity. Ordinarily shoes and clothing are moist enough to ground static charges as fast as generated. Some people, however, have especially dry skin and accumulate high static charges more rapidly than others. Such workmen should not be employed in areas in which volatile flammable liquids are handled or where there is danger of dust explosions.

In dry weather, or in rooms where the relative humidity is low, static charges may accumulate


Mounting bracket and shield
Radioactive source of alpha radiation
Zone of greatest efficiency 1½ in.
Effective zone of ionization 3 in.

A new device for dissipation of static charges is the radioactive tape. One type is shown here.

on the bodies of workmen to a potential of several thousand volts. Thus, in certain locations, some method of grounding the men may be necessary. Workmen should not wear rubbers, rubber boots, or rubber soled shoes in hazardous areas, and under some conditions it may be advisable for them to wear special shoes having copper nails or copper wire stitching through the soles. It may also be necessary to have workers stand on grounded non-ferrous metal plates. Care must be taken however, not to allow the soles of the shoes or the metal floor plates to become covered with any sort of insulating substance.

A precaution to be taken where conductive floors are used is to avoid using a metallic sampler to sample a dolly which has just been pushed across the floor. The static built up by the sloshing can be discharged with a spark through the sampler and the operator, before it has had a chance to be grounded through the wheels of a dolly to the floor.

Mechanical sparks

Mechanical sparks are responsible for many fires in chemical plants. Sparks from grinding wheels, from dropping steel tools on a concrete floor, from falling tools striking machinery or piping, from pieces of iron in grinding mills, and from shoe nails on concrete floors play a large part.

Such sparks start fires only under favorable conditions, such as when they fall into loose dry cotton, combustible dust, or explosive materials.

Special tools of copper-beryllium and other alloys are designed to minimize the danger of sparks in hazardous locations, but cannot wholly eliminate it because a spark may be produced under some conditions. These tools sometimes incorporate pieces of sparking metal in their normal use. Contact with grit is apt to produce sparks. Leather-faced, plastic and wooden tools are preferable to the alloy types. An additional safeguard employed in some highly hazardous areas is to use special linoleums or other soft-surfaced floor coverings to avoid the danger of sparks caused by impact of metal objects on concrete floors.

The greatest hazard of ignition by mechanical sparks is in machinery handling explosive dusts, cotton or similar readily ignitable materials. Magnetic separators, either of the permanent magnet or electromagnet type, are commonly employed in such equipment to remove nails, scrap iron, etc., that may be accidentally present in the stock.

After separation of magnetic material, other sparking materials such as sand and stones, which are almost always of a different specific gravity from the material to be ground, can be conveniently removed by air separation prior to the grinding step.

The hazard of ignition of flammable vapors or gases by friction sparks is often overemphasized. Carbon bisulphide and some other vapors having low ignition temperatures are readily ignited by mechanical sparks. Gasoline and similar hydrocarbon vapors are not readily ignited by such sparks. Nevertheless, it is best to avoid the use of grinding wheels and other sources of mechanical sparks in areas where any flammable liquids, gases or vapors are or may be present, because of the danger of ignition due to some unusual condition. Though wetting down of the area before beginning repair operations that may cause sparks is a good precaution; complete removal of all readily ignitible materials is highly desirable. Water sprays should be used in wetting to avoid stirring up dust clouds. Wetting agents can be used to do a more effective job.

Cutting and welding

Cutting and welding operations are another source of ignition. The following suggestions based on actual loss experience are offered as a practical guide for safe use of cutting and welding equipment in industrial plants.

Appoint a competent supervisor or other employee to have responsibility for the use of portable cutting and welding equipment. Make him responsible for safe operation, and give him authority to establish and enforce suitable precautions. Allow cutting and welding to be done only with his written approval, in safe areas, and by experienced operators.

When outsiders are called in to do cutting or welding, insist that they be subjected to the same system of supervision and precautions.

It is much safer and often easier and quicker to remove a machine part and take it to a safe welding or cutting location than to attempt to remove or protect combustibles that would be exposed by bringing the cutting or welding torch to the area where the machine is located.

If repairs must be made in a location that has contained flammable liquids, gases, or combustible dusts, extreme care should be used to ventilate the area thoroughly and to remove all the combustible material.

Do no cutting or welding on closed containers which may have held flammable liquids or combustible materials. A film of such material may remain on metal surfaces and produce an explosive vapor when heated. This type of work requires special precautions such as purging with steam or an inert gas, or flooding with water.

Do no cutting or welding on ducts which may contain combustible deposits without first making sure the ducts are clean.

Do not use portable cutting and welding equipment in combustible buildings unless they are sprinklered, and unless floors and partitions are tight. Sweep floors clean, and wet down wooden floors or cover them with sheet metal or equivalent. Prevent sparks from outdoor work from entering windows, doors, or other openings.

Before starting work, move any combustible storage or equipment at least 35 ft. away. If it cannot be moved, protect the material against sparks by using asbestos or sheet metal curtains or guards. Shut down processes exposing combustible fibers or materials. Remove dust deposits which may be exposed to sparks. Plug holes in floor so that hot metal cannot drop through. Station a helper to guard against sparks, and have him stay for at least a half hour to watch for smouldering fires.

Matches and smoking needlessly cause costly fires.

Matches Any kind of match when carelessly used can cause a fire, but certain matches have greater fire-causing potentialities than others. Safety matches which strike only on the box are relatively safe. Good safety matches have heads that do not fly and substantial sticks treated to prevent afterglow. Safety matches can be obtained with the Underwriters' Laboratories' label as evidence of good quality. Some strike-on-box matches, particularly of foreign manufacture, have heads that are likely to fly and poor quality sticks; such matches are not worthy of the designation "safety."

Paper or book matches, frequently of inferior quality, are considered less desirable than the box type of safety match.

Strike-anywhere matches may cause fire by friction in pockets or by being stepped on. The better types have protected tips to reduce the danger of ignition by accidental friction.

Smoking Smoking should be prohibited in all areas where match flames or the careless disposal of smoking materials may be a serious hazard. While complete prohibition of smoking is desirable, it is difficult to enforce except in areas where the hazard is obvious to occupants of the building. It is often better to allow smoking in safe places and at specified hours when supervision can be maintained than to run the risk of surreptitious smoking in out of the way places. It is good practice, where smoking is permitted in certain areas and prohibited in others, to mark the respective areas clearly, and where smoking is permitted to provide an ample number of ash receptacles and non-removable lighters, electric or gas. In some plants where highly hazardous products are manufactured, employees are prohibited from carrying smoking materials or matches into the plant.

Many fires are started by sparking and arcing of electrical equipment. The principal precautions to prevent fire from electrical equipment are to install equipment as described here and then give it excellent maintenance.

In locations where flammable liquid vapors may be present, electric wiring should be installed and maintained in rigid conduit and fittings approved for use in such atmospheres.

Motors Explosion-proof motors should be used near hazardous liquids, especially near floor level, and in any pits or depressions below the floor because flammable vapors are heavier than air and collect at the floor and in low places.

Totally enclosed or vapor-proof motors are generally acceptable in well ventilated rooms for installation outside the zone of high flammable vapor concentration, and non-sparking open squirrel-cage motors can usually be used if they are mounted more than 4 ft. above the flammable liquid surface and at least 20 ft. away from the flammable liquid tank, spray process, draining area, or other surface where flammable liquids evaporate. Sparking-type motors should be kept away from flammable liquids.

Another safe arrangement is to locate the motor outside the fire wall, with a shaft drive through the wall. Motors driven by compressed air are preferable to electric motors for agitators in mixing equipment, hoists, and similar uses near flammable liquids.

Heating appliances Heating appliances should be used only when of such nature or with such special temperature-limiting safeguards that the auto-ignition temperature of the flammable liquid cannot be reached. It is much safer to heat with steam wherever possible.

Motors, controllers, thermal cut-outs, switches, relays, the switches and contactors of auto-transformer starters, or other devices, which are liable to spark or heat should not be installed near flammable liquids unless the device is approved for use in explosive atmospheres. Ordinarily, it is more economical to locate switches or contactors outside the hazardous area, with auxiliary explosion-proof push-button control switches in the most convenient location.

Lamps All lamps in storage rooms and small mixing rooms should be in vapor-tight globes. Pendant-type lamps should be rigidly supported by conduit. For extra-hazardous operations involving carbon bisulfide, ether, pentane, or for gasoline used hot, lamps outside shining through windows or approved explosion-proof lights with air pressure inside the globe are necessary for safety. Switches for the lamps should be of the explosion-proof type or installed outside the building in which the lamps are located.

Sufficient illumination should be provided by fixed lighting units to eliminate as far as possible the need for portable or extension lamps. In the rare cases where portable lamps must be used, they should be inclosed in a manner approved for explosive atmospheres, and properly protected by substantial metal or other approved types of guards to prevent breakage. Cords should be permanently connected without separable attachment plugs unless these are designed for explosive atmospheres.

Safety flashlights can be purchased and are used instead of portable lamps at many points.

Fuses or circuit-breakers should not be installed in hazardous locations except in explosion-proof cases.

Motor frames, starting or control boxes, conduits, etc. should be properly grounded in accordance with the general requirements for

installation of electric and power equipment outlined in the National Electrical Code.

A special class of electrical equipment has also been developed and approved for use in areas containing highly combustible dusts. This equipment is not explosion-proof, but is designed to prevent the entrance of these dusts.

Good housekeeping eliminates hazards

Rubbish and waste material of various kinds contribute to a large number of fires, and are frequently classified as a fire cause, although, except in the case of spontaneous ignition, such material does not cause fires, but rather furnishes the tinder for ignition by small sources of heat and the fuel for the spread of incipient fires.

Waste disposal

The maintenance of a high standard of cleanliness and order is a basic element of fire prevention. The proper and regular disposal of waste paper and other combustible waste materials is of utmost importance. Metal receptacles, preferably covered, should be used. Waste materials should be removed from important areas at the end of each day's work.

Where not immediately removed from the building, waste paper and other waste materials should be kept in fire-resistive vaults or inclosures. Baled waste is less hazardous than loose material. Waste paper chutes should be of non-combustible construction, cut off at each floor.

Neglected housekeeping in out of the way places, such as in ducts and dryers, is responsible for many fires.

Cleaning compounds

Many cleaning compounds, polishes, and floor oils are hazardous by reason of a tendency to spontaneous heating, or because they contain flammable solvents. All such materials should be handled carefully, and before using any product, its properties should be identified so that proper precautions may be taken in its use. In case of doubt as to the properties of any product, laboratory tests should be made.

In general, compounds containing solvents in the fire hazard class with gasoline are too dangerous for ordinary use. Those in the fire hazard class with kerosene (flash point above 100 deg. F.) should be used only with full appreciation of their combustible character. Liquids in this class when heated to above their flash point have fire hazard characteristics similar to gasoline, and when dispersed in a fine spray at any temperature are very readily ignited by any spark or flame.

Outside housekeeping

Cleanliness and good housekeeping are as essential out-of-doors as they are within plant properties. Rubbish and waste, for example, should not be allowed to accumulate out-of-doors where it can serve to aid in the spread of fire through a plant.

Dry weeds and grass around buildings present a definite fire hazard. Chlorate solutions are often used to destroy the vegetation, but they are also oxidizing agents which furnish optimum conditions for fire or explosion when in contact with combustible materials. During hot periods in the summer, large numbers of fires have resulted from the use of sodium chlorate solutions on dry grass and weeds.

Calcium chloride or agricultural borax, applied dry or in solution, are effective non-hazardous weed killers. Various proprietary solutions containing sodium arsenite are effective in weed killing, and the duration of their effect vary depending upon the weed-killing agent used, the character of the vegetation, and climatic and soil conditions. Manufacturers' directions indicate the amounts that should be used under various conditions.

Removal of dry grass and weeds by burning is a frequent cause of ignition of buildings when grass fires spread beyond control. Such operations should be undertaken only under favorable weather conditions and with ample personnel and extinguishing equipment available to keep burning under control. Flame-throwing torches, sometimes used for this purpose, have the advantage that they may be used at times when the vegetation is not sufficiently dry to propagate fire readily beyond the area reached by the flame thrower, but themselves introduce a hazard if not carefully operated.

Control of chemical reactions

Automatic control of hazardous processes is an important phase of fire prevention. Any automatic control system must be under a scheduled test program, rigidly enforced. Where instrument failure would be particularly hazardous, duplicate equipment and emergency manual controls should be provided.

Pressure alarms

All accepted methods for indicating pressure may be used as an alarm or shutdown. The bourdon tube, the actuating element of the familiar pressure gage, is very useful. The same movement that normally operates the pointer may be used to tilt the mercury switch, position the flapper of a controller, or operate a switch. For high pressures, the spring or weight loaded piston or diaphragm may be used. Serving extensively for low pressures are the inverted bell, manometer, limp diaphragm, and bellows. When static pressure is exerted on both sides of these instruments, they serve for differential pressure applications.

Temperature alarms

Temperature is the most difficult problem in process control. It is also the most difficult to protect properly in an alarm system. The same rules that apply to thermal element installation for controllers apply to alarms. Inherent lags through thermometer wells and incorrect readings due to improper location are factors that nullify the efficient protection of the equipment.

The bimetallic strip used in many home thermostats makes a very good temperature alarm. Recent equipment of this type has the advantage of not being affected by vibration. Distortion of the helical spring from temperature change is also employed.

Temperature may be measured by a galvanometer type pyrometer, potentiometer, or resistance thermometer, and it is possible to utilize their movement relative to the temperature that is being indicated for operating the alarm. The necessary action may be taken from the

rotation of the slide wire contactor, pen-arm shaft, or the rotary or linear movement of the indicator. Pneumatic temperature controllers like those for pressure control are rapidly adaptable as alarms. The radiation pyrometer may operate high temperature alarms by applying the signaling device to the indicating or recording instrument.

Use of inert gas

Inert gas is used to prevent the formation of explosive mixtures in reaction equipment. Applications include cases where the operation can be conducted only in an inert atmosphere because of the hazard, and when the operation has to be conducted at temperatures above the ignition temperatures of the materials in order for the reaction to proceed.

Any inert gas may be used, but considerations of availability and cost limit quantity use to carbon dioxide, nitrogen, and mixtures of carbon dioxide and nitrogen produced by combustion, as in flue gas, internal combustion engine exhaust and other inert gas producers.

Spontaneous ignition

A large number of the flammable liquid fires are caused by spontaneous heating of materials in the vicinity. Most of these fires are caused directly by neglected housekeeping, insufficient cleaning, or careless handling of waste; and many occurred in locations where the normal spontaneous heating of a material was accelerated by additional heat from sources such as dryers, ovens, ducts, and steam lines adjacent to waste materials.

When dangerous spontaneous heating has been detected in a mass of material, the only practical measure in most cases is to overhaul the material, spreading it out to air and cool. Caution should be exercised in the operation, owing to the possibility of uncovering hot spots which may flash into flame when exposed to the air.

In storing any material potentially subject to spontaneous ignition, it is most important to limit piles to the smallest practical size, as this both reduces the tendency to spontaneous heating and facilitates the overhauling operation, should this become necessary.

Maintenance and fire prevention

Electrical

Inadequate maintenance, particularly of electrical equipment, appears to be the cause of some fires in chemical plants. The remedy will include the employment of capable men to make periodic inspections, and the requirement of permanent repairs. Makeshift repairs should be tolerated only during an emergency, and proper repairs should be made as soon as the emergency has passed.

The following suggestions have been made to help eliminate electrical fires:

Keep motor windings, ventilating ducts, commutators, and brush rigging clean. Lubricate regularly and carefully in accordance with the manufacturer's instructions. Examine bearings on important motors daily, others weekly. Check air gap between rotor and stator monthly. Keep commutators smooth and brushes seated perfectly. Check motor leads weekly to be sure the connections are tight, free from oil, and that insulation is in good condition. Maintain good ground connections. Overhaul motors annually, or more frequently under severe conditions.

Keep starting switches, compensators, and air-circuit breakers clean. Maintain contacts in smooth condition. Replace worn parts. Keep electrical and mechanical connections tight. Maintain oil at proper level and in good condition. Check tripping points of circuit breakers monthly.

Make sure that wiring insulation is in good condition and that locknuts and bushings on conduit and armored cable are tight; particularly check locations where vibrations is severe. Pay particular attention to extensions which usually receive hard wear. Keep switch boxes, junction boxes, fuse boxes and panel boxes clean and tightly covered. Keep open wiring clear of pipes and beams and well supported on insulators.

Make certain that circuits are not overfused. Keep fuse clips clean and tight. Be sure fuse assemblies in refillable fuses are tight; ampere rating of "refills" should not exceed rating of fuse case.

Keep transformer oil in good condition and at proper level. Make certain that transformer operating temperatures are not more than 90 deg. C.

Inspect the ground connections of lightning arresters each spring before lightning season, and once or twice during the summer. Resistance should not be over 5 ohms; never run ground wires through pipes for their protection unless wires and pipes are bonded.

Mechanical

Mechanical equipment such as mixers and centrifuges need adequate lubrication to prevent fire. One example may serve to emphasize this point. A fire in a chemical process was found to have started at a none too well lubricated high speed mixer. The bearing temperature of this mixer finally reached the ignition temperature of carbon bisulfide used in the process and a fire resulted. Inadequate lubrication occasionally results from the use of improper lubricants. Such a condition need not exist if the excellent advice of the lubrication engineers of the larger oil companies is followed.

Other suggestions are; maintain automatic control and other safety equipment on a periodic test schedule, give constant attention to the packing boxes and stuffing glands of pumps and valves handling flammable liquids, maintain burners in good condition to keep vapors from coming into contact with flames from faulty installations.

Maintenance is one of the major fire prevention methods used in chemical plants. It must however, be understanding maintenance.

Valuable assistance in the preparation of this report was given by Mathew M. Braidech, research director, National Board of Fire Underwriters; H. E. Magnuson, director of publications, Associated Factory Mutual Fire Insurance Cos.; and Robert S. Moulton, technical secretary, National Fire Protection Assn.

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Process Equipment News

THEODORE R. OLIVE, Senior Associate Editor

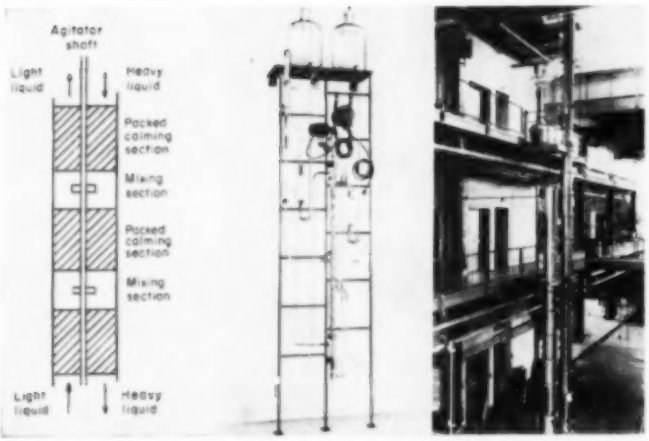


Diagram at left shows principle of York-Schiebel extraction column; center view is a 1-in., 14-stage laboratory column; at right are a 14-in., 30-stage and a 16-in., 12-stage pilot plant column in which development work is presently being conducted.

New Column Makes Liquid-Liquid Extraction Attractive for Industrial Scale Use

Schiebel design makes possible single extraction columns with 50 or more theoretical stages.

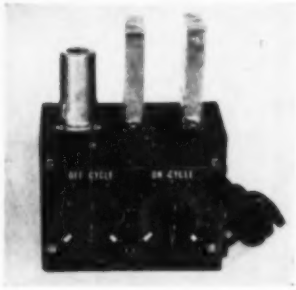
Developed by E. G. Schiebel, of Hoffman-La Roche, Inc., a new liquid extraction column of extremely high efficiency was given its first public showing this month at the New York Chemical Exposition. First described in our unit operations review of May 1948, and discussed in detail in two AIChE papers in the fall of 1948, Schiebel's development has now been given the finishing touches from a commercial standpoint by Otto H. York Co. The laboratory-scale, 1-in., 14-stage column shown above is now available from stock, while larger pilot and plant scale equipment of any size necessary is built to order for each application. Where earlier units of the column type were limited to five or six theoretical stages per unit, the new design is said to make 50 or 60 theoretical stages, or even more, not only possible in a single column, but also practical and economical.

The fundamental idea involved in the York-Schiebel column is illustrated in the sketch at the left above which shows the tower to consist of alternate void sections, containing an agitator, and packed calming and separating sections. Thus, in effect, the column consists of a series of a large number of mixers, each followed by a settling chamber, with the heavy layer moving in one direction through the sequence, and the light liquid moving in the other direction. In an ordinary packed column, much less perfect mixing and subsequent separating are obtained. The height of the column is said to have no effect on extraction stage efficiency, while the effect of column diameter on the height of a theoretical stage is no greater than the corresponding effect on the height of a theoretical plate in a distilling column.

Actually, the height of an extraction stage can now generally be less than that of a distillation plate, with extraction stage efficiency generally greater than distillation plate efficiency.

As a result of this development, extraction may now be headed for many separations which could not be handled economically before, and yet are not suitable or economical for distillation. This may include close-boiling and azeotropic mixtures, mixtures of low volatility, dilute solutions, impurities and color bodies, and structural isomers. As an example, fatty acids and vegetable oils can be separated not only into fractions of saturated and unsaturated products, but also into fractions having compounds of rather precise chain length.

Otto H. York & Co., East Orange, N. J.



FLEXIBLE OPERATION:

Electronic Timer

Designated as the Cyclo-Flex, a new electronic timer of flexible operating characteristics has been introduced by G. C. Wilson. This timer may be operated either single interval with manual initiation, or as a repeat cycle timer with two adjustable intervals which occur successively without any external operation.

Relay contact closure occurs during each interval. Intervals are obtained by charging a resistance-capacitance network. These intervals are virtually unaffected by variations in line voltage, temperature, or humidity. No changes in wiring are necessary to convert the instrument from single interval to repeat cycle operation. If manual operation is desired, a foot switch or other type of contactor may be used. Typical applications occur in refluxing, valve pacing, bottle filling, and temperature control.

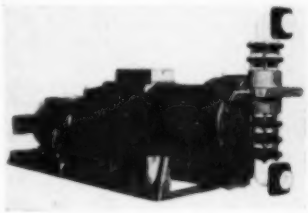
G. C. Wilson & Co., 2 North Passaic Ave., Chatham, N. J.

CUTS REFRIGERATION:

Absorbent Dehumidifier

Reduction in refrigeration requirements for air conditioning, with probable reduction in operating cost, is claimed for the new "controlled humidity" method introduced by Niagara Blower. This method employs a hygroscopic chemical liquid which is sprayed through the air stream over cooling coils which remove the latent heat of evaporation, and also any sensible heat that must be removed. The air stream is then passed through moisture eliminators and diffused to the space to be conditioned. The absorbent liquid is recirculated to the sprays, part of it passing through a concentrator where the accumulated moisture is removed by heat. Units are produced in sizes from 1,000 to 20,000 cfm. of conditioned air. The manufacturer has already made installations not only for comfort conditioning, but also for process use, and for the packaging of hygroscopic products.

The Niagara Blower Co., 405 Lexington Ave., New York 17, N. Y.

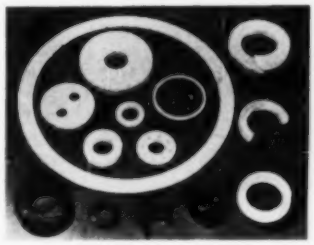


ARMORED PORCELAIN:

Proportioning Pumps

Chemical proportioning pumps with ceramic wet end parts are now available in an extension of the line of Lapp Pulsafeeder pumps. In the new model, the reagent head, valves and valve housings are of armor-incased solid porcelain. The gaskets, valve seat and diaphragm are of inert fluorinated hydrocarbon plastics, such as Teflon or Kel-F. This construction permits all concentrations of all acids, except HF, to be handled, as well as all metal salts other than strong caustics. Chlorinated hydrocarbons, halogens and various liquids that must be kept free from metal ion contamination can also be pumped. This construction, it will be recalled, employs no stuffing box or seal, the pumping element being a hydraulically balanced diaphragm. Flow rate can be adjusted, manually or automatically, while the pump is in operation. Capacities range upward to 330 gph., with pressures to 100 psig. for larger units, 250 psig. for smaller units.

Lapp Insulator Co., Process Equipment Division, LeRoy, N. Y.



MANY SHAPES:

Inert Packing

Known as Chemlon, a new chemically inert packing material is now being produced in molded form in a wide variety of shapes. These are said to retain all the chemically inert properties of the previously available braided packing. The material is unattacked by any acid or alkali and is effective to temperatures of 450 deg. F. The molding process employed is said to result in high flexibility, enabling split packing rings to be placed directly on a shaft without completely removing the gland. The material is also said to have excellent electrical insulating qualities due to low power factor and low dielectric constant. Many shapes now available include washers, bushings, rings, and self-sealing V-cross-section rings. Special shapes can be molded to individual requirements.

Crane Packing Co., 1800 Cuyler Ave., Chicago 13, Ill.

HANDLES LIQUIDS, SOLIDS:

Rubber Pinch Valve

Three principal parts, a rubber tube with integral flanges, a pinching mechanism, and a housing go to make up the

(*Continued*)

This Month . . .

Now that the Chemical Show has come and gone there will be many fine new ideas in equipment to unveil. One for example is the multistage extraction column on the opposite page. Others appear on later pages in this issue and still others will be spread on the record in January. Meanwhile, there are numerous valuable equipment developments described on later pages of this issue . . . See page 134, for instance, if you have the problem of **hydraulic classification** at large tonnage. A new **automatic refractometer** described on page 136 offers another control variable that may be just what is needed for composition control. A brand new idea in **ultrasonic generators** on page 138 may solve a problem for you, and you will be interested in the new, more economical **sphere construction** that is described on page 140.

Next Month . . .

Since many of the new ideas introduced at the Chemical Show had not been revealed when this department went to press, we hope to be able to deal with several outstanding developments in the January issue, both in a special feature article on equipment trends indicated by the Show, and in regular new equipment articles.

Marshall and Stevens Indexes of Comparation Equipment Costs

(1926 = 100)

Compiled quarterly for March, June, September and December of each year by Marshall and Stevens, evaluation engineers, Chicago and Los Angeles. Indexes are prepared for 47 different industries, from which the eight process and four related industries listed here are selected. Published each month with the latest available revision. For a description of the method of obtaining the index numbers see R. W. Stevens, **Chemical Engineering**, Nov. 1947, pp. 124-6. For a listing of annual averages since 1913 see **Chemical Engineering**, Feb. 1949, p. 129.

Industry	Sept. 1948	June 1949	Sept. 1949
Average of all	166.5	160.6	159.6
Process Industries			
Cement mfg.	160.5	155.9	155.9
Chemical	168.5	163.9	162.4
Clay products	155.5	150.9	150.4
Glass mfg.	158.6	154.0	153.5
Paint mfg.	161.8	157.2	156.7
Paper mfg.	162.1	157.5	157.0
Petroleum ind.	164.9	160.3	159.8
Rubber ind.	167.3	162.7	162.2
Process ind. avg.	165.9	161.4	160.4
Related Industries			
Elec. power equip.	170.1	165.5	165.0
Mining, milling	169.2	164.6	164.1
Refrigerating	181.5	174.8	173.9
Steam power	157.2	152.6	152.1

new Wilcox rubber pinch valve which is reported suitable for handling any material that will flow (including pulverized solids) provided only that the material transported is not damaging to natural rubber, or that the temperature is not too high. The tube is fabricated from natural rubber, reinforced with woven duck plies. A steel yoke with two half-round steel members, brought into closing position by a screw arrangement, comprises the pinching mechanism. All operating parts, including the non-rising bronze screw, are contained in a sealed, cast aluminum alloy housing. To assure even wear on the tube, it can be rotated from time to time simply by removing the flange bolts. The valve is claimed to close tight, even around coarse particles, and to give good control and long life under severe service conditions.

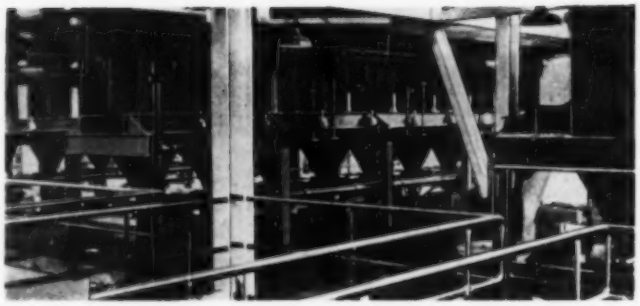
Ray Wilcox Co., 1436 Land Title Bldg., Philadelphia 10, Pa.

QUICK REVERSIBILITY:

Improved Control Valve

Quick reversibility of action is the most important new feature of a new Foxboro Stabilflo control valve. It requires only a few minutes' time, without the use of special tools, to change the valve from "air to open" to "air to close," or vice versa. The valve is similar in appearance to the conventional type produced by this manufacturer, but is modified to the extent that, to reverse its action, it is only necessary to remove the housing assembly, rotate it one-quarter turn, and replace it. This means removing and replacing only four bolts. The feature not only permits quick changes in the field, but enables users to carry smaller stocks of spare valves.

The Foxboro Co., Foxboro, Mass.



HIGH CAPACITY:

Hydraulic Classifier

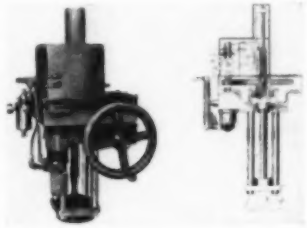
In the past, feed capacity of hydraulic classifying equipment has been relatively low. In fact, there appeared to be engineering reasons why a successful separator of this type for handling large tonnages was impossible. These difficulties have now been overcome, it is stated, in the new Concenco SuperSorter which at present is being used in one large installation for the preparation of metallurgical coal and in another installation in preparing concrete aggregate which must meet extremely close specifications for the construction of a large dam in North Dakota. According to the manufacturer, it appears that the new classifier should be suitable for any hydraulic classification application where a large feed capacity must be handled. Present consideration is being given to the use of this equipment in both the phosphate field of Florida and the potash field of New Mexico. Other applications will probably fall in the cleaning of anthracite coal and in classifying metalliferous ores.

This classifier is of the multiple spigot type, comprising a number of individual classifier cells attached to the bottom of a free settling launder. Each individual cell consists of an outer shell with a conical bottom, and an inner cylinder concentric with the outer shell. Hydraulic water is admitted tangentially into the annular space between the outer shell and the inner cylinder or sorting column, thereafter spiralling downward to the bottom of the sorting column and then rising with a swirling motion through that column to the free settling launder. This water then overflows into either the succeeding compartment of the launder, or into an overflow launder, or both, depending on the classifier setting. The flow of hydraulic water is adjusted to the several cells so that its ascending velocity is greatest in the first cell, decreasing progressively through each of the succeeding cells until it has the least velocity in the last.

Thus, feed which enters the No. 1 cell is carried over to the No. 2 cell, except for the largest or heaviest particles which are capable of settling against the water velocity in this cell. In each succeeding cell particles of increasing fineness are trapped in the conical bottom. The individual classified products are drawn from the cell bottoms by means of constrictor valve mechanisms which are mechanically operated to be opened for any desired portion of the cycle, so as to regulate closely the rate of draw-off.

The accompanying illustration shows the first installation of the new classifier, consisting of four eight-cell units operating at 100 tons per hour on ¼ x 0-in. bituminous coal. The products from the several cells are tabled individually on diagonal-deck coal washing tables. The water requirements are said to be low for apparatus of this type and, aside from pumping and materials handling, the only power requirement is for a 1½-hp. motor driving the constrictor valve mechanisms.

The Deister Concentrator Co., 901 Glasgow Ave., Fort Wayne 1, Ind.



NOVEL DESIGN:

Pneumatic Operator

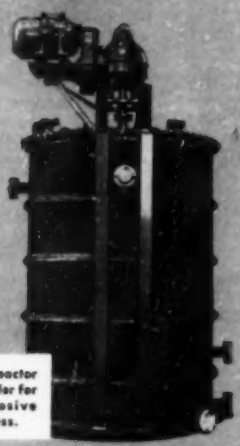
Unlike any other pneumatic power operator for the throttling control of valves is a new Conoflow operator

(*Continued*)

Before You Buy Processing Equipment Of Any Kind...

STAINLESS STEEL autoclave (test pressure, 10,000 psi; operating temperature, 1000° F.)

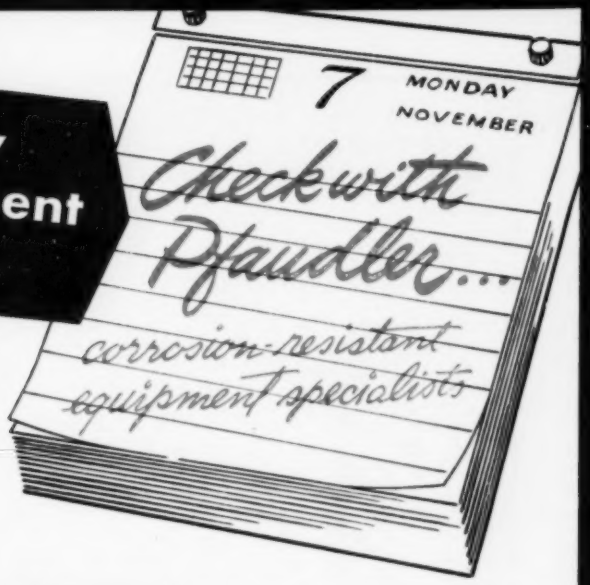
NICKEL reaction equipment intended for processing pharmaceuticals.



HASTELLOY reactor built by Pfaudler for highly corrosive smelting process.

GLASS-LINED STEEL reactor for processing highly corrosive acids.

STAINLESS STEEL cooling coil for large stainless steel vessel.



Here's Why! Pfaudler is in the unique position to recommend the materials of construction best suited to any given requirements—at the most favorable price!

Specifically:

	GLASS-LINED STEEL	TEFLON
HASTELLOY	NICKEL	STAINLESS STEEL
TANTALUM	NICKEL CLAD	STAINLESS CLAD
MONEL	INCONEL	ALUMINUM
MONEL CLAD	INCONEL CLAD	CARBON STEEL

Every material has its place. You can make sure each type is soundly recommended, engineered and fabricated when you do business with Pfaudler. There are nearly 70 years of know-how back of Pfaudler recommendations. Sound engineering and ample plant facilities back up these recommendations.

For Example! Take the welded Hastelloy reactor shown. It is the best answer to a highly corrosive smelting problem, cost and service life considered. The stainless steel, nickel and glass-lined steel units shown are typical of the *complete* engineering and fabricating service Pfaudler is now rendering its customers. So before you buy processing equipment of any kind, first check with Pfaudler. No obligation, of course.

Pfaudler

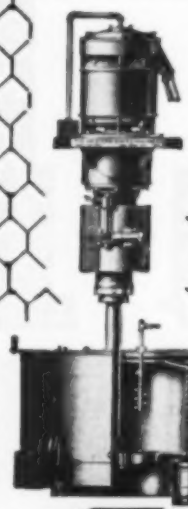
THE PFAUDLER CO., Rochester 3, N. Y. Branch Offices: 330 West 42nd St., New York 18, N. Y.; 111 W. Washington St., Chicago 2, Ill.; 1325 Howard St., San Francisco 3, Calif.; 818 Olive St., St. Louis 1, Mo.; 6432 Cass Avenue, Detroit 2, Mich.; 1318 1st Nat'l Bank Bldg., Cincinnati 2, O.; 1041 Commercial Trs. Bldg., Philadelphia 2, Pa.; 751 Little Bldg., Boston 16, Mass.; 334 Chattanooga Bank Bldg., Chattanooga, Tenn.; P.O. Box 4066, Dallas, Texas; Taylor St., Elyria, Ohio; Enamelled Metal Products Corp., Ltd., Artillery House, Artillery Row, London, S. W. 1, England.

THE PFAUDLER CO., ROCHESTER 3, NEW YORK

Engineers and Fabricators of Corrosion Resistant Process Equipment

GLASS-LINED STEEL
Hastelloy—Aluminum
Tantalum—Carbon Steel
Solid or Clad Stainless Steel
Nickel, Inconel, Monel

THE ROBERTS FLUID DRIVE
CENTRIFUGAL
IS REALLY A HONEY



In this machine and in this machine alone are the following features to be had:

Standard motor, with current peak less than 40% of direct connected (special) motor drives.

Uniform torque . . . adjustable application.

Simple adjustment for accurate speed control.

And further, the inherent design of the Roberts Fluid Drive Centrifugal allows special characteristics to be incorporated with ease, thus suiting it exactly to your individual application. Your inquiry will have our full and prompt attention.

ROBERTS
The
WESTERN STATES
MACHINE COMPANY
HAMILTON, OHIO, U. S. A.

known as the Rotomotor. The device employs a reversible pneumatic motor and gear-driven screw stem. It has a continuously connected handwheel permitting manual control of the valve if desired. Accurate positioning to within 1/500th part of the stem travel is claimed. It is said to be sensitive to instrument air changes as low as 0.025 psi., and features stem travel up to 20 in. and stem speeds up to 12 in. per min. It is intended for operating valves, dampers, and other control devices, and is said to be suitable for any heavy-duty throttling control application.

Conoflow Corp., 2100 Arch St., Philadelphia 3, Pa.

PRESSURE CAUSES FLOW:

Electric Carboy Pump

Available with liquid contacting parts of lead, hard rubber or Saran, a new electric pumping unit for removing either corrosive or non-corrosive materials from carboys has been developed by Belke. The pump is slipped into the carboy and connected to the carboy neck by a self-sealing rubber connection. Turning on the motor switch operates a small compressor to build up a maximum of 3 lb. air pressure in the carboy and discharge the acid steadily through the outlet pipe. Flow can be stopped instantly by releasing the air pressure with a stop lever.

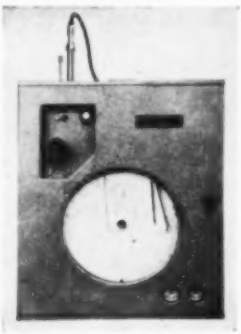
Belke Mfg. Co., 944 North Cicero Avenue, Chicago 51, Ill.

CORROSION RESISTANT:

Pressure Regulators

For the precision control of many gases, wet or dry, such as chlorine, sulphur dioxide, hydrogen sulphide, ammonia, and boron trifluoride, Victor Equipment Co. has developed a new line of corrosion-resistant regulators, amplifying its previous line of cutting and welding gas regulators. Regulators are available for delivery pressures up to 5,000 psi. and gas volumes up to 2,000 cfm. If desired, they can be provided for remote control and to meet any desired corrosion-resisting requirements. Large volume self-seating relief valves, which function at any pressure from 1 to 2,000 psi., can be supplied.

Victor Equipment Co., 844 Folsom St., San Francisco 7, Calif.



CONTROLS PROCESSES:

Automatic Refractometer

First automatic recording and controlling refractometer available commercially has been developed by Precision Scientific in conjunction with the Dow Chemical Co. Known as the Robomatic Refractometer, the device will automatically measure and record the refractive index of any clear solution, doing so throughout the entire range of refractive indexes from 1.32539 to 1.54409. The instrument incorporates a pneumatic control mechanism which is claimed to control within three parts in the fifth decimal place over the entire range.

The new instrument is stated by the manufacturer to offer many opportunities for savings by eliminating costly hand sampling, giving instantaneous and continuous response to any product change, and eliminating human errors. It is claimed that in many instances its entire cost can be liquidated through savings in less than six months. Composition of many process streams can be controlled, it is claimed, through refractive index control. Examples are said to fall in the production of plastics, synthetic rubber, petroleum products, ammonia, pharmaceuticals, bleaches, and in the production of all aqueous and alcoholic solutions not containing suspended solids. Uses fall not only in industrial but also in pilot plant and laboratory operations.

In operation, the process liquid is pumped continuously through a constant temperature bath which sur-

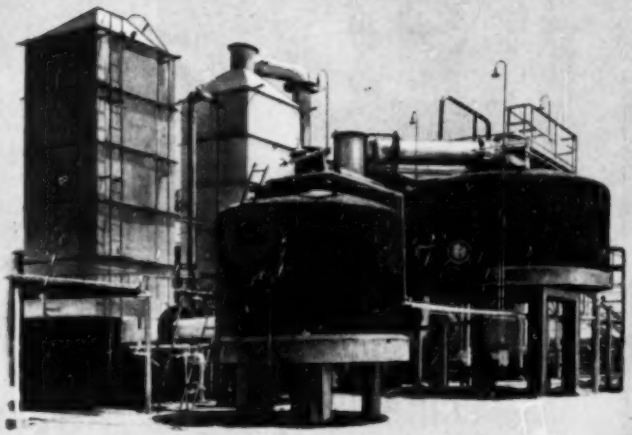
(Continued)

SULPHUR RECOVERY FROM WASTE GASES

$2H_2S + O_2 = 2S + 2H_2O$

Plants installed, and currently under construction by Foster Wheeler total over 600 tons per day

The recovery from waste H_2S bearing gases, such as occur in natural gas and spent gases from petroleum refining operations, has become a profitable operation. Foster Wheeler has been identified with the development since the first commercial installation in the United States in 1942.



One Responsibility and One Overall Guarantee

Foster Wheeler experience in the design and fabrication of special equipment, such as required for a successful sulphur recovery plant, extends over a long period of time and contributes materially to the insurance of proper overall plant operation and results.

For further information, write:

FOSTER WHEELER CORPORATION

165 Broadway, New York 6, N. Y.

FOSTER WHEELER

Everyone has problems

If yours happens to be chrome dyeing... *Investigate*

VICTOR DIAMMONIUM PHOSPHATE

Victor diammonium phosphate is a unique and valuable chrome-dyeing assistant . . . one which is rapidly increasing in importance and popularity with dye-men. It is a powerful buffer which prevents wide fluctuations in pH and promotes unusual levelness and easily reproduced dyeings. Due to the iron-repressing properties inherent in phosphates, chrome colors become brighter. The use of diammonium phosphate saves considerable time and additional processing, since it helps eliminate the need for corrective redyeings. If you would like experimental samples of Victor diammonium phosphate, or a copy of our recent Technical Service Bulletin, "Victor Diammonium Phosphate in Chrome Dyeing," write us or fill in and return the handy coupon.

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☐ Sample of Victor Diammonium Phosphate

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V 4

rounds a dipping refractometer prism. A sodium light behind the bath sends light through the liquid to an eyepiece for adjustment purposes, and also to a photoelectric cell. The cell output is passed through an amplifier to operate the recorder and also the pneumatic control system. The instrument is designed for flush mounting and can be installed at any distance from the process pipes.

Precision Scientific Co., 3737 West Cortland St., Chicago 47, Ill.

STRESSES VERSATILITY:

Ultrasonic Generator

Application of ultrasonics in a wide variety of uses, such as mixing, emulsification and reaction, is likely to receive a quick boost through the introduction by Brush Development of a new ceramic type wave producer which can give a focused effect and is not limited in size and output as are piezoelectric crystals. This now means that a large amount of vibrational energy can be applied at ultrasonic frequencies, not only by means of mechanical devices such as the sirens previously available, but also electrically as well. First public showing was at the New York Chemical Exposition earlier this month.

Hypersonic is the name given by Brush to the new equipment which is to be produced in a laboratory model designated as BU-101, in a more powerful pilot plant model labelled BU-102, and in custom-built types for full scale industrial use. Each size of generator will be supplied in package form.

Scarcity of natural quartz for piezoelectric crystals, especially in sizes large enough for industrial ultrasonic use, prompted the search for other materials which could be given a controlled high frequency vibration

by application of an electric field. Artificial crystals for the purpose are extremely expensive if large enough for industrial use. A solution to the problem came unexpectedly from work of the Titanium Alloy Mfg. Co. (now a division of National Lead) on the development of a ceramic dielectric containing barium titanate. It was found that this ceramic can be made in such a way as to give a mechanical response to an applied electric field this being comparable to, and in certain ways superior to, piezoelectric crystals.

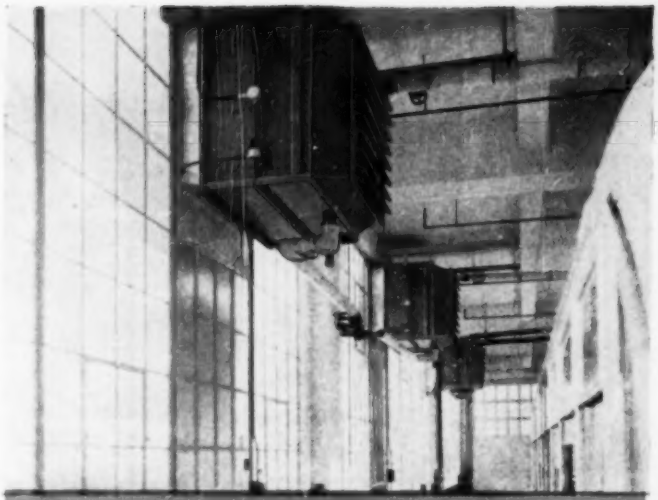
For one thing, a crystal will produce its mechanical action in a fixed direction, whereas with the new ceramic "transducers" the direction of mechanical action can be controlled by the geometrical configuration and suitable polarizing. Furthermore, transducers can be made in various shapes such as tubes or spherical shells, so as to focus the sound energy produced in a restricted area where the energy concentration can thus be much greater than at the surface of the ceramic.

The company does not state how this effect is produced but it may be speculated that the polarizing field used during manufacture may have an

(*Continued*)

SPRAY COUNTER

University of Wisconsin engineers R. J. Parent, professor of electrical engineering, and R. W. Schumann, graduate student, have developed an electronic device capable of automatically sorting and counting the thousands of liquid drops shot out of the nozzle of a spray drying machine. Never before have adequate data been available on the character of sprays produced in different ways. The new machine, shown here operated by two chemical engineering students, may well solve this difficulty, not only in spray drying, but in oil burning and internal combustion engine carburetion. *University of Wisconsin, Madison, Wis.*



Wing Variable Temperature Heater Sections will not freeze

Write for a copy of Bulletin HS-3

Damage by freezing cannot happen to a Wing Variable Temperature Heater Section even when the entering air is at a very low temperature, because the heating element is always under full steam pressure. Temperature control is achieved automatically or manually by changing damper position, not by reducing steam pressure.

Wing Variable Temperature Heater Sections are used for fresh air supply, for replacing exhausted air, for ventilation plus heating and for drying and process work.

L. J. Wing Mfg. Co. 170 West 14th Street, New York 11, N. Y.

Factories: Newark, N. J., and Montreal, Canada

Wing

Featherfin HEATER SECTIONS

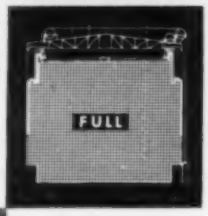
SAFER

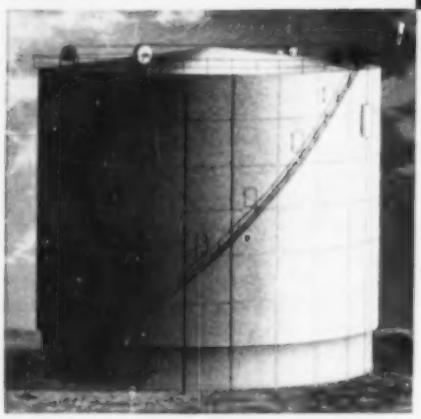
INSPECTIONS STORED GAS COMMUNITIES

with the new **Dry Seal**

Wiggins Gasholder

NO WATER! NO GREASE! NO TAR!





Toxic or explosive mixtures can't accumulate outside the storage space!

Moving parts are weather protected. No snow or ice loads to fight. Piston can't freeze!

Delivers all chemical process and industrial gases exactly as received. No liquid to evaporate and adulterate the gas. No dehumidification is necessary!

Absolutely safe storage at pressures up to 20" of water!

FIND OUT ABOUT THE GREATER SAFETY, GREATER ECONOMY, GREATER VERSATILITY OF THE WIGGINS GASHOLDER NOW!

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effect of orienting certain crystals just as crystals are oriented during the manufacture of optically polarizing films; and that the so-oriented crystals act individually as piezoelectric crystals, with an additive effect to give a controlled direction of mechanical action equal to the sum of all the individual crystal effects.

The new transducers are able to produce high power without the high voltage required by quartz crystal generators.

Hypersonic Div., Brush Development Co., Cleveland, Ohio.

CONSERVES METAL:

Sphere Construction

In a recently released research report, J. O. Jackson, vice-president in charge of engineering and research of Pittsburgh-Des Moines Steel Co., described a new method of construction for spherical storage vessels which results in substantial reduction in the amount of steel required, and in the total length of welded seams. The actual percentage saving compared with conventional constructions depends to some extent on the size of the sphere, but, as a typical example, in a sphere of 28.75 ft. inside diameter, formed of 1¼-in. thick steel plate, and designed for a working pressure of 205 psig., the saving in erected cost was 13.4 percent as compared with a similar sphere constructed according to the conventional orange peel design.

The new design, known as the Icosasphere, derives its name from the icosahedron, which is a regular polyhedron having 20 faces, the largest number possible in any regular polyhedron.

The shell of such an icosahedron may be made from five parallelograms, which may be cut by multiplying from a rectangular plate with practically no scrap loss. It was reasoned, there-

(*Continued*)

fore, that it should be possible to form a spherical shell with a minimum of scrap from five parallelogrammic units, i.e., units of roughly parallelogram shape.

There is an interesting story in the way this design was determined. Since methyl methacrylate plastics can be formed hot into various shapes, but will "relax" and return to their original form if reheated out of the mold, the method chosen was to form a sheet of plastic into a portion of the surface of a sphere by heating and then cooling within a wooden mold. This spherical portion was then laid out to contain one of the five equal parallelogrammic units which would form a sphere. After trimming to size the piece was heated and relaxed on a flat plate to produce the shape which, after forming to the same spherical diameter and being subjected to the same plastic flow, would give the shape initially laid out.

Carrying this same idea to steel (after careful measurements of the parallelogrammic unit produced) showed that flow in the metal was substantially the same. However, it was found that the largest diameter vessel that could economically be produced from five parallelogrammic units is about 14.8 ft. in diameter. To obtain the advantages of the method for larger spheres it is necessary to subdivide each unit into several

(Continued)

BIG RAW MATERIAL CACHE

At its Derry, Pa., porcelain plant, Westinghouse is completing a silo installation which will hold nearly 32 carloads of raw material clays. The four silos being built are each 68 ft. high and 14 ft. in dia., fabricated of concrete slab construction reinforced with iron bands. They will be charged by a pneumatic conveyor, discharged by gravity. Westinghouse Electric Corp., East Pittsburgh, Pa.

McALEAR

No. 1500 PILOT

Here's the ultimate in accuracy of control for pressure reducing, back pressure, pressure relief, vacuum, vacuum relief, pump governor regulation or boiler fuel governor service. It is the new McAlear 1500 PILOT which reduces hysteresis to a minimum through use of a spiral sensitive spring in place of the conventional "C" gauge spring.

The No. 1500 PILOT may be mounted either above the valve it operates or remotely on a panel (surface or flush) without alteration. No tools required for adjustment of throttling band or for conversion from direct to reverse action.

Installed with the McAlear No. 115 or 116 Diaphragm Motor Valve (left), it gives you a completely coordinated "package" for sensitivity control. Write for bulletin No. 150.

McALEAR Mfg. Co.
1907 SOUTH WESTERN AVENUE
CHICAGO 8, ILLINOIS

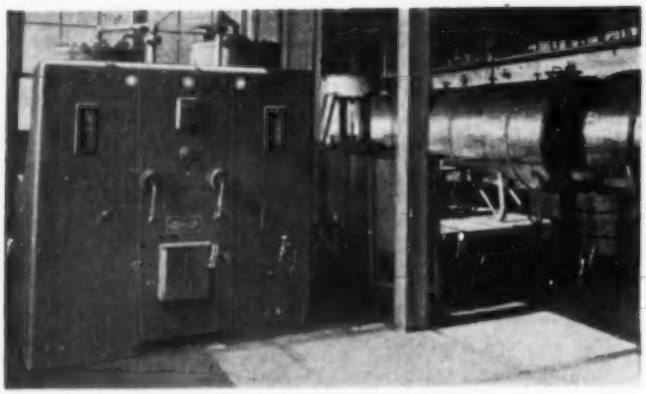
REPRESENTATIVES IN PRINCIPAL CITIES
AN INDEPENDENT MANUFACTURER FOR OVER 40 YEARS

A report on the use of Dorrco D-I water in pharmaceutical and cosmetic manufacture.

d-i water

SHARPLY REDUCES COSTS

SIMPLIFIES PRODUCT CONTROL



at LEHN & FINK PRODUCTS Corporation

INSTALLED over three years ago, the Dorrco D-I System shown above has been continuously de-ionizing water for use in the manufacture of pharmaceuticals and cosmetics. Total operating expense has averaged *13 cents per 1,000 gallons of demineralized water* produced. The unit has performed *exactly* as specified when sold . . . and has required no resin replacement in either cell.

At Lehn & Fink, D-I water has resulted in a substantial saving where substituted for distilled water . . . has simplified product control by eliminating a variable when substituted for raw water.

This is but one case where D-I water is paying off on many counts. Regardless of industry, if your process requires water free of dissolved solids, a package or open-type Dorrco D-I System will produce it . . . in any amount . . . at a fraction of the cost of distillation.

Write for Bulletin #4081 for complete details.

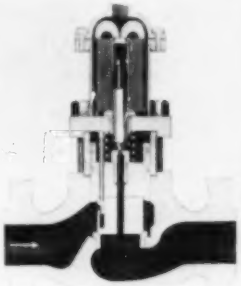
THE DORR COMPANY
ENGINEERS
Ion-Exchange Division

NEW YORK 22, N.Y. . . . . 570 LEXINGTON AVENUE
CHICAGO 1, ILL. . . . . 221 NO. La SALLE STREET
DENVER 2, COLO. . . . . COOPER BUILDING

smaller units. These can be chosen, however, so that in the relaxed form all of the units (say, 20) required for a complete sphere will be roughly rectangular in shape, and will involve relatively little scrap.

In the case of the 28.75-ft. sphere already mentioned, the total area of plates required for fabrication was 3,670 sq.ft. for the orange peel construction and 2,970 sq.ft. for the Icosasphere. The first construction required 590 lineal feet of welded seam, and the second, 468. The second required 19 percent less steel, and 20.7 percent less welding. As the accompanying view indicates, the new construction lends itself readily to field fabrication.

Pittsburgh-Des Moines Steel Co., 3417 Neville Island, Pittsburgh, Pa.



LOW-VOLTAGE:

Solenoid Valve

For applications where, for safety or other reasons, it may be desired to use storage battery power, rather than the local current supply to operate solenoid valves, the Hoppe Engineering Co. has developed a line of packless pilot-operated, 6-volt solenoid valves in sizes from ¼ to 10 in. The valve is suitable in forged steel construction for oil or oil vapor service on temperatures to 1,000 deg. F., or for steam, water, air, gas, and general service at temperatures up to 850 deg. F.

To open the valve a momentary contact button is depressed, the solenoid lifts the armature, thus opening a pilot valve which is held open by permanent magnets. To close the valve, the lower solenoid is energized momentarily, which pulls the armature down, thus closing the pilot valve. An adjustable time delay feature is built in to eliminate water hammer.

The forged steel construction is

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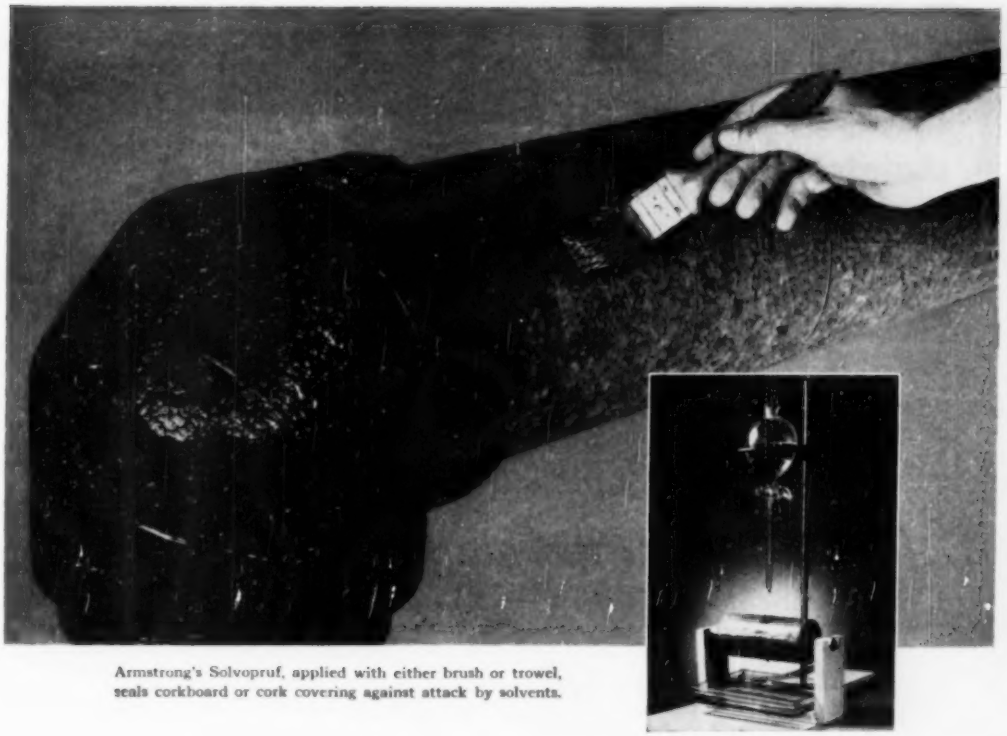


Armstrong's Solvopruf, applied with either brush or trowel, seals corkboard or cork covering against attack by solvents.

How to protect insulation from attack by solvents

Cork insulation can now be thoroughly protected against the deteriorating effects of solvents. This is made possible by Solvopruf, a new compound developed by Armstrong. Solvopruf resists the liquid solvents and fumes that may attack vital insulated cold lines in chemical process plants and refineries.

This new product is specially formulated for use either as an adhesive or a protective finish. It is a self-curing compound that can be applied by brush or trowel and sets to a rubberlike film in two hours at room temperatures. It will remain in this condition when exposed to temperatures from 35° below zero to 125° F. After about a week of aging, Armstrong's Solvopruf is resistant to the action of toluol, methyl ethyl ketone, gasoline, kerosene, water, and benzol.

In one oil refinery where solvent vapors are a special problem, Armstrong's Solvopruf was applied three years ago to cork covering on cold lines. In this test, as well as in extensive testing in Armstrong's Research Laboratories, Solvopruf has satisfactorily withstood solvent attack.

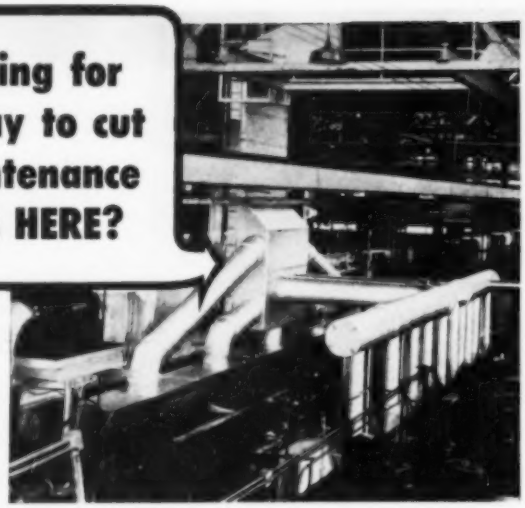
Meeting and solving all types of insulation problems is part of the day-to-day work of Armstrong's Contract Service. This complete contracting organization offers buyers of low-temperature insulation a complete package, including qualified engineering advice, efficient materials, and skilled mechanics to apply them. For full information on this service, write today for the free booklet, "People Make A Good Insulation Job." Armstrong Cork Co., 3312 Concord St., Lancaster, Penna.

ARMSTRONG'S INDUSTRIAL INSULATIONS

MATERIALS (A) INSTALLATION

FOR ALL TEMPERATURES FROM 300° F. BELOW ZERO TO 2800° F.

Looking for a way to cut maintenance costs HERE?



. . . Use Transite Industrial Vent Pipe

IF REPLACEMENT of venting equipment is running up your plant maintenance costs, Transite* Industrial Vent Pipe may help you save money.

In numerous installations, this Johns-Manville asbestos-cement product has demonstrated its ability to give long-term, economical service. Rustproof, it successfully resists many of the corrosive fumes, dusts, vapors and gases encountered in industrial venting operations. It requires no painting or other protective treatment—can be used for vents, ducts or stacks, in either indoor or outdoor service.

Transite Industrial Vent Pipe is available in a wide range of sizes (up to 36" diameter) with a complete line of Transite fittings that adapt it to practically any job requirement. It is light in weight and readily handled—can be cut and drilled on the job with ordinary tools. For additional information, write for Data Sheet, Series DS-336. Address Johns-Manville, Box 290, New York, N. Y.

JM

*Transite is a Johns-Manville registered trade mark.

Typical industries in which Transite Industrial Vent Pipe is used:

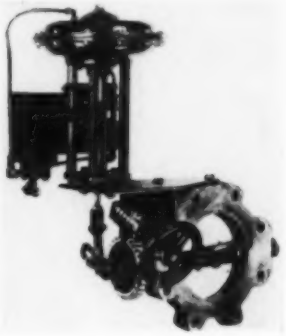
Aircraft	Dairy	Gas	Paint	Shipbuilding
Automobile	Drug	Glass	Petroleum	Shoe
Baking	Electrical	Laboratory	Potash	Smelting
Bleaching	Explosives	Laundry	Pulp & Paper	Soap
Boiler Works	Farm Machinery	Leather	Quarrying	Soft Drink
Brewing	Food	Match	Railroad	Sugar Refining
Canning	Foundry	Meat Packing	Rayon	Textile
Ceramic	Furnace	Metal	Refrigeration	Tool
Chemical	Furniture	Mining	Rubber	Water & Sewage

Johns-Manville
TRANSITE Industrial Vent **PIPE**

NEW EQUIPMENT, cont. . .

built in sizes from ½ to 2 in., while corrosion-resistant construction is available in ¼ to 3-in. sizes. High-pressure, corrosion-resisting valves can also be made in sizes to 10 in. A wide variety of both ferrous and non-ferrous alloys can be used for this purpose.

Hoppe Engineering Co., Greensboro, Ind.



NOVEL DESIGN:

Process Control Valve

Rato-Vane is the name given to a new line of wafer-type air-operated butterfly control valves now available

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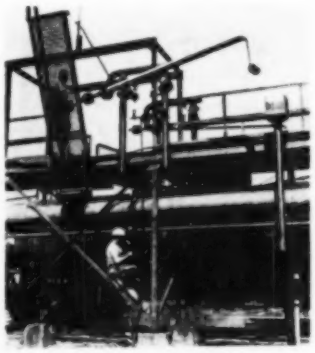


REDUCES WORKER FATIGUE

Tank car filling has been expedited and worker fatigue lessened in Ohio Oil Co.'s 30,000-bbl. refinery near Robinson, Ill., through the use of an all aluminum swing line at the filling dock. The line is 12 ft. long, 4 in. in diameter, and fabricated with Tube-Turn aluminum welding fittings. The total weight is 42 lb., and handling is further facilitated by means of a counterweight. If made of steel pipe and fittings, it would weigh about 129 lb. *Tube Turns, Inc., 224 East Broadway, Louisville 1, Ky.*

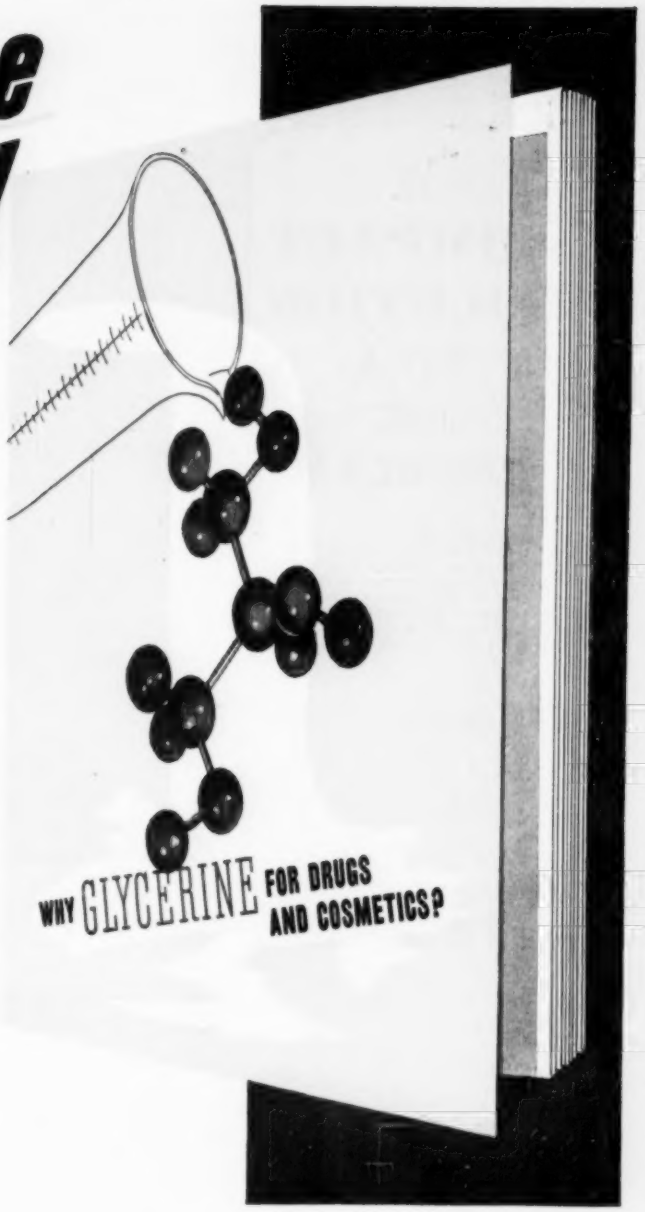
First Time Offered!

a practical review of GLYCERINE applications in Drugs and Cosmetics—

WHERE? . . . How? . . . Why? . . . If you're looking for the answers to these questions on glycerine usage in the drug and cosmetic industries—here's the most up-to-date information available!

"Why Glycerine for Drugs and Cosmetics?" has been reviewed by prominent medical authorities, technical consultants, and the Research Laboratories of the Glycerine Producers' Association. Contains detailed information by charts and tables of the physical and chemical properties of glycerine—the origin and development of this amazingly useful alcohol—grades and their applications. 16 pages of practical, useful data!

Whether you now use glycerine or just wonder about its possibilities . . . whether you're in management, production, or research . . . an expert on glycerine, or thoroughly unfamiliar with the subject—you'll want this informative booklet. Write for your free copy—today! *Address: Dept. CE, Glycerine Producers' Association, 295 Madison Avenue, New York 17, N. Y.*



GLYCERINE PRODUCERS' ASSOCIATION
295 Madison Avenue, New York 17, N. Y.

AIRBORNE CONVEYORS FOR HANDLING POWDERED PRODUCTS

A COMPACT SOLUTION TO A BIG PROBLEM

PROBLEM—Transport Powders by air through a pipe line. Separate dust from the air at the receiving end where headroom is insufficient to accommodate obstructive equipment yet do not spend money for building alterations.

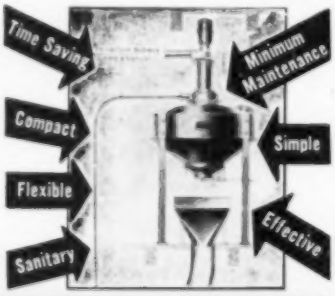
SOLUTION—The pneumatic conveying system was installed with an AIRBORNE Centrifugal Separator designed so compactly that the processor was assured of a smooth working installation in a minimum of space, at lowest initial cost and lowest operating expense.

AIRBORNE *Centrifugal* SEPARATORS

AIRBORNE Centrifugal Separators excel in the handling of gases at high temperatures, moisture laden fumes, chemicals known to attack iron and steel (since they can be constructed of corrosion resisting metals), recovery of metallic particles from furnace gases. Sanitary and easy to clean, they have proved invaluable to the Food Processing Industries.

AIRBORNE Engineers and Manufactures Complete Conveying Installations. No Need to Divide Responsibility.

Remember: If it's a Complete Conveying System Plus Filterless Centrifugal Separator —it's AIRBORNE.



AIRBORNE CONVEYORS CORP. 99 WARREN STREET NEW YORK 7, N. Y.

in a complete range of sizes from 3 to 12 in. These valves handle static line pressures up to 125 psig., and differential pressures up to 50 psig. The novel new construction is said to feature great strength, lightness, compactness, and accessibility. One important advantage is that the entire assembly is installed in the line with only one set of through bolts. Valve bodies can be supplied in a variety of corrosion-resisting alloys and plastics. The Type 316 stainless steel vane can be fitted with a rubber seal when required. Such valves are customarily supplied with hand jackscrews, air-operated diaphragm, and valve positioner.

Fischer & Porter Co., Hatboro, Pa.

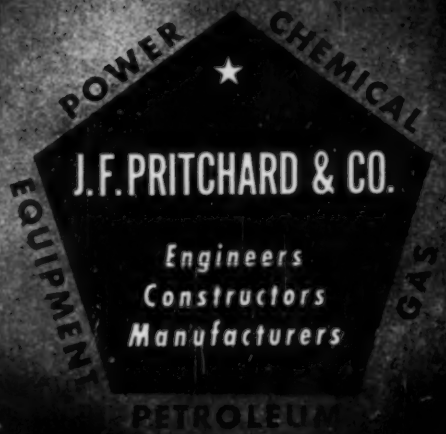
REMOTE READING:

Temperature Indicator

The latest development in Fairchild high-temperature indicators is the Model 263 for measuring gas temperatures to more than 5,000 deg. F. The instrument does not have to operate at the temperature of the gas being measured and hence its range is not limited by the thermal properties of available materials. In operation, a small sample of the gas is obtained by means of a water-cooled stainless steel probe. The gas sample immediately passes through a small iridium orifice, after which it is cooled and passes through a second metering orifice and manually operated pressure reducing valve to atmosphere. By adjustment, the differential pressure drop across the iridium orifice will be a linear function of the absolute temperature of the gas being measured. A differential pressure gage connected across the orifice then indicates the temperature of the gas.

Fairchild Camera & Instrument Corp., 53 West Union St., Pasadena, Calif.

(Continued)



SYMBOL OF ASSURANCE

J.F. Pritchard & Co.

ENGINEERS • CONSTRUCTORS • MANUFACTURERS
for the CHEMICAL, PETROLEUM, GAS & POWER industries

908 Grand Ave. • Kansas City, Missouri
Offices in Principal Cities from Coast to Coast

Facts about Norwalk's New Semi-Portable High Pressure Compressor

A semi-portable compressor developed for use in laboratories, pilot plants, and wherever pressures up to 6000 pounds are required in relatively small volume

This semi-portable four stage compressor is built with precision and is the equal of larger Norwalk units in all respects except volume. Pressures up to 6000 pounds, with a displacement of two to three cubic feet per minute, are produced. The compressor is 7′ long, 3′4″ high, 2′2″ wide. Smaller machines can be manufactured.

Portability is achieved through the base, an integral part of the machine which can be equipped with iron or rubber-tired wheels.

Cylinders are constructed entirely of steel, and can be made of any corrosion-resistant material specified, such as stainless steel. They are lubricated with a force feed lubricator, and are equipped with the latest type Norwalk reversible ring plate valves.

Cooling coils are placed directly under the cylinders in a small tank, so that all moving parts of the compressor are both compact and accessible.

The compressor has but one stuffing box, with a double-sealed housing surrounding it.

Running gear is of conventional type, though smaller in size, and is equipped with Timken Roller main bearings and a splash system for lubrication.

Norwalk is prepared to design and build these semi-portable compressors to your specifications or to meet specific conditions.

Send for illustrated pamphlet.

N

NORWALK COMPANY, INC.

SOUTH NORWALK, CONNECTICUT

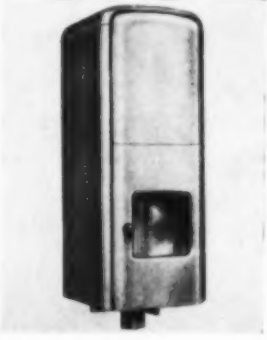
Manufacturers of High Pressure Compressors for Air and Gases for more than 80 Years

FEATURES RESILIENCY:

Flexible Metal Gasket

Newest of developments by Flexitallic for high-pressure, high-temperature applications is a new all-metal gasket said to possess the qualities of solid metal without the rigid characteristics of ordinary solid metal gaskets. In several applications the new gasket is said not to have taken the permanent set customarily expected with solid metal gaskets. Even after extended service under great changes in pressure and temperature, it is claimed to retain the resiliency required to maintain a tight seal. This new construction involves several types of ferrous and non-ferrous metals used in combination, employing the basic spiral-wound design long used by this company.

Flexitallic Gasket Co., Eighth & Bailey Sts., Camden 2, N. J.



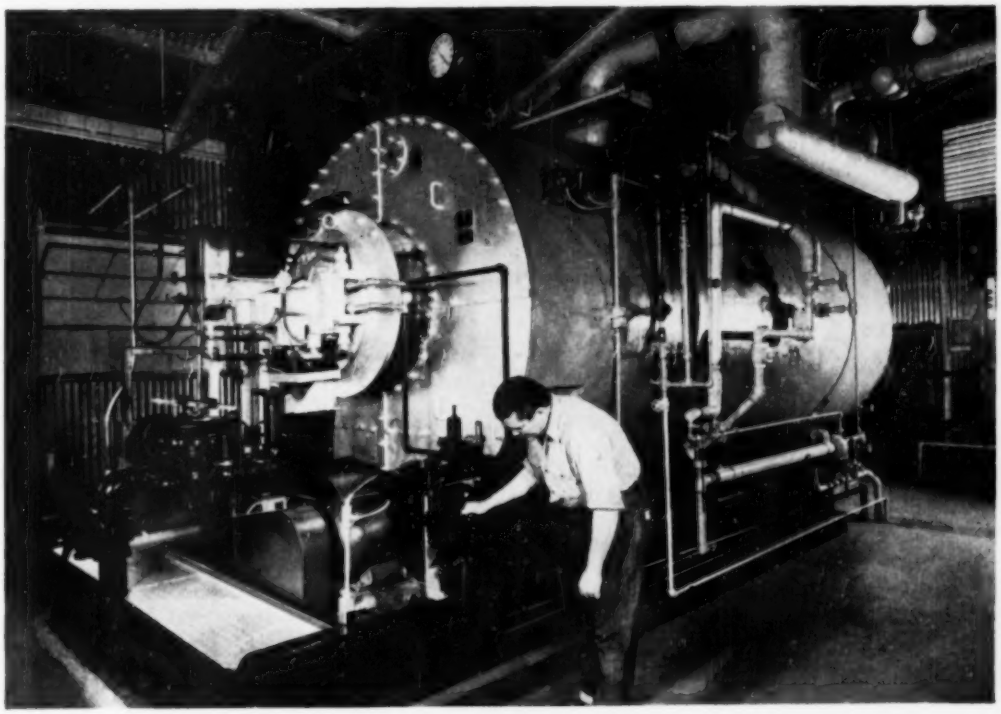
PROVIDES PROTECTION:

Instrument Cabinets

A newcomer to the Gilbarco line is a series of standardized metal cabinets for process control instruments, intended to protect such equipment in outdoor installations. These cabinets are weatherproof and insulated with foil-covered asbestos. A hinged door,

(*Continued*)

Boiler HORSEPOWER Isn't Enough



Modern Boilers must have EARNING POWER, too

BECAUSE the cost of generating steam — for processing, production or heating needs — demands a substantial share of your operating budget, you can't afford to be complacent about your boiler.

If you want to cut fuel and maintenance costs, look to your boiler. Look beyond boiler horsepower ratings and rate your boiler in terms of its *earning power* for you — its ability to deliver steam at lowest cost.

For any boiler installation (15 to 500 HP.) — new or replacement — Cleaver-Brooks offers these immediate and long range cost saving advantages:

A Custom-Planned Boiler Engineered for Your Needs: Your steam needs and steam-using equipment are studied — your present total steam load plus your estimate of future expansion are considered — with this information the size of Cleaver-Brooks boiler best suited to your specific needs is determined.

Factory Starting Service: Your boiler is placed in operation by Cleaver-Brooks factory service-engineers. Your operators are trained in operation, care and maintenance.

Flexible Operation Burning Gas or Oil With Equal Efficiency: You can use oil, gas, or combination oil and gas, whichever is of lower cost. Through high heat transfer, Cleaver-Brooks boilers operate at a guaranteed efficiency of 80% from full load down to 30% of rating.

In addition, Cleaver-Brooks boilers give you clean, smokeless operation — eliminate fuel and ash handling — require no high or costly stacks — no special foundations — fit under low headroom—provide quick steaming, flexible operation to meet fluctuating loads — fully meet all codes.

Available in sizes 15 to 500 HP., 15 to 200 P.S.I. — write for Cleaver-Brooks steam boiler bulletin.

CLEAVER-BROOKS COMPANY
339 E. Keefe Ave., Milwaukee 12, Wis.

WRITE on your business letterhead for Steam Cost Calculator — a ready reference slide rule showing comparative steam costs when using oil, gas, or coal as fuel. Mailed on request—no obligation.

Cleaver-Brooks
STEAM BOILERS

it's TOPS in its class

Fig. 2140
GLOBE
125 lb. S.P.
200 lb. W.O.G.

125 lb. S. P. BRONZE GLOBE, ANGLE and CHECK VALVES
Built to LUNKENHEIMER QUALITY STANDARDS

Want a lower pressure valve to give the same dependable, low-cost service you get in higher pressure LUNKENHEIMER Valves?

Here it is — New Fig. 2140 Globe; Fig. 2141 Angle; Fig. 2142 Lift Check; Fig. 2144 Swing Check. These valves feature Lunkenheimer's traditionally fine design and sturdy construction, plus exclusive silicon bronze alloy stems which eliminate stem thread failure due to wear.

Whatever your requirements for lower pressure service, you'll find these new valves unequalled for dependability and true economy.

Your LUNKENHEIMER DISTRIBUTOR is stocking these new 125 lb. S.P. Bronze Valves. Call upon him for your original equipment, replacement and repair valve requirements. Ask him for Circular No. 582 or write direct.

Fig. 2142 LIFT CHECK
125 lb. S.P. 200 lb. W.O.G.

Nowhere in the line is dependability more important than in Check Valves. These Checks function quickly and positively, seat accurately and tightly.

Fig. 2144 SWING CHECK
125 lb. S.P. 200 lb. W.O.G.

ESTABLISHED 1862
THE LUNKENHEIMER CO.
"QUALITY"
CINCINNATI 14, OHIO, U. S. A.
NEW YORK 13 · CHICAGO 6
BOSTON 10 · PHILADELPHIA 34
EXPORT DEPT. 310 322 HUDSON ST. NEW YORK 13 N Y

NEW EQUIPMENT, cont. . .

either with or without a window, is provided for changing charts or making adjustments. Furthermore, in the larger cabinets, the entire front half may be removed quickly without tools. Several different mountings are available.

Gilbert & Barker Mfg. Co., West Springfield, Mass.

BRIEFS . . .

SENSITIVE PAPER. For all sorts of recording applications, including instrument recording, process monitoring, computer recording and facsimile transmission, a new electrosensitive paper is now available for producing legible markings from low-voltage timed impulses at extremely high rates of speed. Various types of recorders, including existing stylus recorders, can be used, provided only that the paper can be maintained at the desirable level of uniform humidity. *Alfax Paper & Engineering Co., 39 Riverside Ave., Brockton, Mass.*

NUT LOOSENER. Kroil is a new chemical for loosening frozen nuts and bolts. It comes in a can equipped with a finger-operated pump and is claimed to loosen tight fittings within a few minutes. *Kano Laboratories, 75 East Wacker Drive, Chicago 1, Ill.*

SAFETY FLOOR. Perma-Tread is the name of a new heavy-gage cast aluminum floor plate containing fine silicon carbide grit material distributed through the casting and permanently bonded to its surface. The material is suitable for use wherever slipping danger exists, and is said to provide actual savings of 40 percent or more compared with other similar products. It is made 1 ft. wide in lengths up to 6 ft. and in thicknesses from $\frac{1}{4}$ to $\frac{3}{4}$ in. *Mold-Cast Alloy Corp., 2140-A Montcalm St., Indianapolis, Ind.*

FLOOR PLATE. Abrasive rolled steel floor plate for non-skid floors, working platforms and stairways is now being produced under the name of A. W. Algrip. It is claimed the new plates never lose their non-slip characteristic, because as the surface wears new abrasive particles are constantly exposed. The abrasive grain, the same type used in grinding wheels, is rolled as an integral part of the upper portion of the steel floor plate, which is available in thicknesses from $\frac{1}{4}$ to $\frac{3}{8}$ in., and in widths up to 60 in. maximum by 144 in. long. *Alan Wood Steel Co., Conshohocken, Pa.* —End

Piccolyte

the Versatile Resin

Drives your costs down . . .

Keeps your quality up!

Can you use these Piccolyte Properties ?

LIGHT LEMON COLOR
HYDROCARBON STRUCTURE
NO ACIDITY
NO SAPONIFIABLE MATTER
CHEMICAL RESISTANCE
SOLUBILITY IN ALIPHATIC NAPHTHAS
THERMOPLASTIC
COLOR STABILITY

Low-cost, high-quality PICCOLYTE provides many useful properties that enable you to reduce costs without sacrificing any of your product's values. Not only is Piccolyte low in cost, but it is readily soluble in low-cost solvents. Easy to use, because it is compatible with waxes, oils, other resins and other ingredients.

Send for a free sample, specifying intended use.

PICCO

PENNSYLVANIA
INDUSTRIAL CHEMICAL CORP.
CLAIRTON, PENNA.

Makers of: Coumarone Resins • Coal Tar Solvents • Styrene Resins • Rubber Plasticizers • Reclaiming Oils • Terpene Resins • High Solvency Naphthas • Solvent Oils

Plants at Clairton, Pa. and Chester, Pa.

Distributed by:
Pennsylvania Falk Chemical Co., Pittsburgh 30, Pa.
and
Harwick Standard Chemical Co., Akron 5, Ohio

New Products and Materials

JOSEPH A. O'CONNOR, News Editor

Cream Protects Workers' Skin

To protect workers' skin against paints, printing ink, lacquers, grease, grime and oil, a protective hand and arm cream for shop use has been developed by Chase Chemical Co. Containing no harmful wax fillers, the new hand cream, called Glov-Cote, has received the severest tests in the manufacturing, printing and automotive service industries. Results show that it guards the skin pores against the irritating causes of dermatitis, states the manufacturer. One application provides many hours of skin protection.

Glov-Cote forms a protective glove-like film over the hands and arms that washes off easily even with cold water. As it dissolves, the protective coating carries with it the paint, grease, ink or grime that gathers during normal working operations.

No curative powers are claimed for Glov-Cote. Instead, it reduces dermatitis caused by exposure of the skin to chapping and harsh cutting oils as a result of frequent and excessive washing with strong soaps or kerosene ordinarily required to cut grease, dirt or paint that lodges in skin pores.

Use of Glov-Cote relieves the manufacturer of many problems, including lost-time compensation cases due to dermatitis, dissatisfaction of female employees with grimy hand appearance that results from many types of assembly-line or processing operations.

Glov-Cote is packaged in handy individual 16-oz. jars for individual employee use. Small sample containers of Glov-Cote are to be obtained from the manufacturer, together with additional information.

Chase Chemical Co., 2901 Dover Ave., Cleveland 9, Ohio.

FOR FOUNDRIES:

Resin Binder

American Cyanamid Co. has introduced Cycor 191, which is a liquid, synthetic-resin binder for sand cores and dry molds.

This new product is similar to the dry powder, Cycor 151, in that it contains none of the additives, such as cereal, fly ash, silica and flour. However, these lower priced materials may be added in the muller to produce cores of whatever properties the user wants. Also, it is similar to Cycor 151 in that it produces water-resistant cores that withstand high humidity and long lay-overs in the mold.

Cycor 191 can be pumped or metered, and it is otherwise adaptable to existing equipment and methods common to many foundries. It can be cured in either conventional or electronically heated ovens.

American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y.

FLAKED:

Dihydrazine Sulphate

To encourage the more widespread use of the base hydrazine, Mathieson Chemical Corp. is now producing technical-grade dihydrazine sulphate, $(N_2H_5)_2SO_4$, in semi-commercial quantities for the first time. Of 95 percent minimum purity and containing 37.5 percent available hydrazine, N_2H_4, the salt is being produced in flake form.

A crystalline, colorless salt, the dihydrazine sulphate has marked advantages over the present commercial hydrazine acid sulphate, $N_2H_5HSO_4$, which is extensively used as a convenient carrier of hydrazine. Not only does dihydrazine sulphate contain 60 percent more hydrazine and have a twenty-fold greater solubility in water, but it is also less corrosive than hydrazine acid sulphate, and requires only half as much base to free an equivalent amount of hydrazine.

Applications suggested include its use as a carrier for hydrazine in organic synthesis and in the synthesis of pesticides and herb; as a catalyst in polymerization of vinyl type resins, and as a reducing agent for metal finishing operations.

A technical data sheet, No. 124.1, on dihydrazine sulphate can be secured from Mathieson. Technical-grade dihydrazine sulphate is available in 1-lb. glass bottles, 20-lb. pails and 250-lb. fiber drums.

Mathieson Chemical Corp., 60 East 42nd St., New York 17, N. Y.

REACTIVE:

Acrolein and Derivatives

For the first time Carbide & Carbon Chemicals Corp. is turning out large-scale commercial quantities of acrolein. With its price slashed, acrolein can be considered for uses that were formerly economically impossible.

Carbide is also supplying many primary derivatives of acrolein. Allylidene diacetate, an interesting monomer for polymerization and copolymerization, and ethyl beta-ethoxypropionate, used in the synthesis of vitamin B_1, are already in commercial production. Process development work is completed and samples of beta-methyl mercaptopropionaldehyde (an intermediate for the synthesis of the amino

This month . . .

Keep your eyes peeled for these new product stories on following pages . . . The new acrylonitrile-vinyl chloride staple fiber, described on p. 154, possesses outstanding resiliency . . . If you are looking for a low-priced synthetic wax to replace a higher priced one in coatings and films, see p. 156 . . . Turn to p. 158 to find out about a long-oil alkyd that cuts the time required to brush on flat paints made from it . . . Big news for the feed industry on p. 160 is word of the commercial production of Animal Protein Factor from a new source by fermentation . . . Also on p. 160 is the description of a styrene copolymer resin emulsion that improves floor waxes to which it is added . . . And on p. 162 there is revealed a permanent phthalocyanine blue for printing inks.

Next Month . . .

To whet your interest, here are a few new products we shall tell you about next month . . . One is a low-cost tertiary amine with possibilities as an emulsion stabilizer . . . Others are a series of distilled glyceryl monoesters and a group of fatty acids, purified by a new process.

acid methionine), beta-ethoxypropionic acid, beta-ethoxypropionaldehyde and beta-chloropropionaldehyde are available.

By producing both acrolein and its primary derivatives, Carbide will supply not only manufacturers who require large quantities of acrolein itself, but also others whose application will permit the use of an acrolein derivative and thereby avoid their handling a dangerous, unpleasant and toxic chemical.

Carbide & Carbon Chemicals Corp., 30 East 42nd St., New York 17, N. Y.

LICKS PLASTICIZER:

Aromatic Materials

Getting rid of disagreeable plasticizer odors in finished plastic products either by eliminating or masking them adds to consumer appeal. Five new aromatic materials, called Res-O-Dors, either neutralize objectionable odors or impart desired pleasant odors.

The Res-O-Dors withstand the high milling temperatures encountered in processing vinyls and other plastic products. They are inexpensive, for they involve no additional manufacturing processing, and are effective in small concentrations. The Res-O-Dors can be incorporated during preliminary mixing of the plasticizer and resin in concentrations as low as 1/40 to 1/10 of 1 percent, based on the total weight of the mix.

Sindar Corp., 330 W. 42nd St., New York 18, N. Y.

In these mixers, stearate greases are prepared for evaluation.

Aluminum Stearate: Grease Stabilizer

A new aluminum stearate, called No. 22-G grade, has been developed specifically for the grease industry by the Witco Chemical Co.

This new stearate, No. 22-G, possesses extremely high gelling characteristics, and from the standpoints of yield and economy is said to be unequalled.

It is quite common in the grease industry to secure a wide variation in physical properties depending upon the temperature of the plant at the time of production. This new aluminum stearate eliminates the major manufacturing problem besetting volume production. Greases manufactured during extremely hot or extremely cold weather are uniform.

Stability of greases containing No. 22-G is outstanding. There is less bleeding during storage. Even extreme working of 100,000 strokes does not change penetration values appreciably from those obtained after 5,000 strokes. Those grease manufacturers who are equipped with the right working equipment will find No. 22-G offers extremely high yield with any type of base oil regardless of origin.

Quality of Witco's aluminum stearate No. 22-G has been established in the grease industry on the basis of many production runs.

Witco Chemical Co., Inc., 47 Ann St., New York 7, N. Y.

FREE-FLOWING:

Titanium Dioxide

Du Pont has come up with a new grade of titanium dioxide that is tailor-made to the needs of the ceramic industry, particularly to the requirements of makers of vitreous enamels. Distinguishing characteristic of this new industrial raw material is its free-flowing property, which permits satisfactory dry mixing and handling.

This grade of titanium dioxide was developed for use in vitreous enamels as an opacifier. It is also expected to have other applications in the ceramic field. Effective use of titanium dioxide has been made possible by recent advances in the method of manufacturing vitreous enamel. Titanium dioxide is replacing other materials because of the economy in its use and the ability to obtain opacity with a

(Continued)

thinner film, thus imparting greater flexibility without cracking. It also adds to the acid resistance of the enamel.

Du Pont's new grade of titanium dioxide, which has been trademarked Ti-Pure VG, has a chemical purity equal to pigment grades. Particles are large and the material is free-flowing.

Principal advantages are: it will not stick or ball during dry mixing; premixing or hammer milling is eliminated; handling is improved; there is little dusting in handling; and its bulk density reduces required warehouse space and charge volume.

Now available for shipment, the new grade of titanium dioxide sells at the basic price of 19.5 c. a lb. in carload lots.

E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del.

LICKS SHORTAGE:

Lanolin Alternative

To lick the worldwide shortage of lanolin, Croda Ltd., a British firm, is making available a carefully blended lanolin alternative. It contains not less than 50 percent genuine wool wax alcohols.

The product has all the properties of normal lanolin. It is similar in melting point, color and function.

The product will be found useful as an alternative to lanolin in many spheres in which the latter product is at present utilized. Some examples: production of rust preventives, emulsions, plasticizers, inks and paints.

One standard grade of Agnolin, as it has been dubbed, is currently being manufactured. But special melting-point grades will be made available for special purposes; for example, as an alternative to normal waxes for insulation, polishes, anti-corrosive preparations, dipping waxes and stopping-off waxes.

Croda Ltd., Croda House, Snaith, Goole, Yorkshire, England.

CRYSTAL CLEAR:

Liquid Detergent

New amber-colored liquid detergent developed by the Atlantic Refining Co. is Ultrawet 60 L. It is an organic alkyl aryl sulphonate that is 60 percent active ingredient and 40 percent water.

Ultrawet 60 L remains crystal clear at temperatures below 20 deg. F. This feature, coupled with high foaming characteristics, outstanding detergency and strong wetting properties, is expected to result in demand for Ultrawet 60 L as a dishwashing detergent for use both in households and in restaurants and hotels.

Other possible applications where the unique low temperature solubility characteristics, in addition to the other properties, may be of value include cosmetic formulations such as shampoos, various textile processes, emulsion polymerizations and insecticidal formulations.

Ultrawet 60 L is available in tank cars, tank trucks and specially lined 55-gal. drums.

Atlantic Refining Co., Chemical Products Section, 260 South Broad St., Philadelphia, Pa.

First it's spun tow, then staple, and finally twisted yarn.

Dynel: New Resilient Synthetic Fiber

Dynel is the new generic name chosen by Carbide & Carbon for its staple fiber. This name specifically denotes acrylonitrile-vinyl chloride staple to distinguish it from the older Vinyon yarns developed by Carbide.

Dynel lists among its advantages high resilience, "loft," warmth, strength, fire resistance, moth-proofness and fungus inertness. What is more, the fiber possesses dimensional stability and dries rapidly. It can be dyed readily on conventional machinery and is expected to sell at a moderate price. Dynel can be handled easily on the cotton, wool, worsted and spun silk systems.

Fabrics made of dynel will not support combustion. They will char, but when the source of ignition is removed, there is no further burning. Clothes moths and carpet beetles starve to death rather than attack dynel fibers. The complete moth-proofness of dynel is of interest for apparel, blankets and floor coverings.

High resilience of dynel fibers contributes unusual and permanent "loft" of fabrics. The fibers are non-felting. This characteristic makes possible materials that will stand vigorous launderings without loss of fabric resilience. Dynel is light in weight, launders and dry-cleans well without shrinkage. Its fibers do not absorb water; only the surface is wet. This means that dynel fabrics will dry rapidly. The fabrics can be laundered in high concentrations of detergents and soaps without deterioration. Though fabrics made from this material can be steam-pressed without losing any of their good qualities, they should not be hot-ironed. Experience with stabilized knit and woven fabrics made from dynel indicates that pressing is often unnecessary.

Fabrics made of dynel will not support fungus, mildew or bacterial growth. Tests under adverse conditions show that the dynel fabrics were not affected even after being buried six months in moist soil. This quality will be especially useful for many applications in warm, moist climates. A characteristic of importance to industrial users is that of dynel's resistance to chemical attack.

Bright colors with good fastness to light, washing, and crocking have been attained with a large number of acid dyestuffs. Acetate colors, although inferior to the acid dyestuffs in light fastness, can be employed to give good wash and crock fastness.

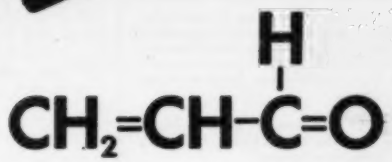
At present, dynel is available in development quantities. However, Carbide is about to increase production capacity at its present South Charles-

(*Continued*)

From SHELL CHEMICAL

New Lower Price!

ACROLEIN



THE VERSATILE, EXTREMELY REACTIVE INTERMEDIATE

Because of its almost unlimited reaction possibilities, Acrolein is being used or is under consideration for a wide variety of products.

At the new, substantially reduced price, Acrolein is now an even more attractive intermediate . . . allowing economical exploration of its use for important new products.

Some of the products of the many possible Acrolein reactions are listed here. If you are working with any of these, we suggest that you investigate the advantages *and new economies* of Acrolein. We will be glad to discuss the use of Acrolein in your processes.

PROPERTIES

Molecular Weight	56.06
Specific Gravity 20/4°C.	0.8389
Melting Point	—86.9°C.
Boiling Point	52.7°C.
Flash Point, Tag Open Cup	Below 0°F.

Colorless . Soluble in alcohol and ether

REACTIONS OF THE CARBONYL GROUP

Reactant	Conditions of Reaction	Products of Reaction
KCN	Glacial acetic acid in ether solution	$CH_2{=}CH{-}\underset{OH}{CH}{-}CN$ acrolein cyanohydrin
Malonic acid	Pyridine solution	$CH_2{=}CH{-}CH{=}CH{-}COOH$ 2,4-pentadienoic acid
Acetic anhydride	In presence of acid	$CH_2{=}CH{-}\underset{O{-}C{-}CH_3}{\underset{\|}{CH}}{-}O{-}C{-}CH_3$ acrolein diacetate
C_2H_5MgBr	Grignard solution	$CH_2{=}CH{-}\underset{OH}{CH}{-}C_2H_5$ 1-penten-3-ol
HCl (dry)	Low temperature	$Cl{-}CH_2{-}CH_2{-}CHO$ β-chloropropionaldehyde

REACTIONS OF THE DOUBLE BOND

Furan	Presence of SO_2 and high temperature	2-furanpropionaldehyde and 2,5-furandipropionaldehyde
Cyclopentadiene	Elevated temperatures	2,5-endomethylene-1,2,5,6-tetrahydrobenzaldehyde
RSH	—	$R{-}S{-}CH_2{-}CH_2{-}CHO$ β-alkylthiopropionaldehyde
Phenol	In presence of acid or dilute alkali	aldehyde type resins

SHELL CHEMICAL CORPORATION

EASTERN DIVISION
500 Fifth Avenue, New York 18

WESTERN DIVISION
100 Bush Street, San Francisco 6

LOS ANGELES · HOUSTON · ST. LOUIS · CHICAGO · CLEVELAND · BOSTON · DETROIT · NEWARK

In safety circles everywhere Flex-a-Foam Filter Masks are making news, because here for the first time is a respirator that workers really welcome and wear—without the usual prodding from supervision. Look at these unusual features:

1. **It's light and easy to wear—weighs only 1 ounce, fits any size face with comfortable snugness.**
2. **It's *easier* to breathe and talk through than an ordinary linen handkerchief.**
3. **It's exclusive method of headband adjustment keeps mask snug and comfortable—without tension or hair pulling.**
4. **It's so smartly styled that workers don't look or feel peculiar, and are no longer the brunt of jokes.**
5. **It's low in cost, low in upkeep—easy to clean and keep clean.**

FLEX-a-FOAM'S filter is a honeycomb of whipped foam latex that *keeps out non-toxic nuisance dusts as small as 1/25000 of an inch.* Positive-locking molded plastic frames are so flexible they adjust themselves to every wearer's facial contours, yet so tough they're unbreakable in normal usage.

For the utmost in comfort, efficiency and economy, treat your workers to Flex-a-Foam Filter Masks—lowest priced *quality* respirator ever made.

Attention Agents and Jobbers
Your interest is invited

The Goggle Parts Company — Dept 8
Cleveland 13, Ohio
Please send full information and prices on Flex-a-Foam Filter Masks.

Name .....
Position .....
Company .....
Address .....
City ..... Zone ..... State .....

THE GOGGLE PARTS COMPANY
CLEVELAND 13, OHIO

ton, W. Va., plant. These commercial facilities are expected to be running in the second quarter of 1950.

Carbide & Carbon Chemicals Corp., 30 East 42nd St., New York 17, N. Y.

BY THE TON:

Animal Protein Factor

Tonnage production of the highly touted Animal Protein Factor provides a new source of this supplement for livestock and poultry feeds. U. S. Industrial Chemicals, Inc., is turning out APF, which is believed to be a group of vitamins that are part of the vitamin B complex, as a primary product of a direct bacterial fermentation. Heretofore, APF has been obtained as a byproduct of antibiotic operations.

The new fermentation APF has a vitamin B_{12} content about 40 times that of good fish meal. This vitamin compound is one of the most effective known for supplementing chicken and hog feeds.

U. S. Industrial Chemicals, Inc., 60 East 42 St., New York 17, N. Y.

IN NEW FORMS:

Teflon Plastic

Du Pont has come up with new forms of Teflon that will enable chemical, electrical and other industries, for the first time, to take full advantage of the tetrafluoroethylene resin's extreme resistance to chemical corrosion and its ability to withstand high temperature.

Evolution of the new forms, not yet in commercial production, is regarded as being almost as important as the discovery of the plastic Teflon itself. Teflon has been difficult to fabricate and heretofore it has been possible, only by slow and costly methods, to make the plastic solely in relatively simple shapes with limited industrial uses.

Recently, however, Du Pont researchers discovered that Teflon could be made as a suspensoid, a form in which fine particles of the plastic are held suspended in a liquid. This led to equally important discoveries—how to make Teflon adhere to metals and how to make finishes that could be sprayed. Out of this new suspensoid form of Teflon, five new finished product developments have been evolved, which are expected to have considerable industrial use when sufficient suspensoid becomes available.

These five finished products are: (1) industrial finishes that may be applied with paint-spraying equipment to metals and thus, for example, may be used to give chemical tanks corrosion-resistant linings; (2) enamels for insulating fine wire that can be coated at a rate of about 50 ft. a min. on standard wire-coating machinery, for use in electric motors, transformers and generators; (3) compounds for extruding heavier insulation onto wire at rates upward of 20 ft. a min. in contrast to the present rate of 6 ft. an hr.; (4) unsupported Teflon film of improved quality and in thinner gages; and (5) glass fabrics coated with Teflon.

In addition, the suspensoid is offered by Du Pont as a raw material that will find many other uses.

The plastic will resist the attack of virtually all chemicals, except molten alkali metals, up to 500 deg. F. Hence the importance of the new forms to the chemical process industries.

The Teflon tetrafluoroethylene resin spray finishes, wire enamels and coated glass fabrics are being produced by Du Pont's Fabrics & Finishes Department. Teflon suspensoid, the extrusion compounds and the new unsupported film and tapes are being manufactured for testing purposes by the company's Polychemicals Department. Experience with the new forms of the plastic has been confined to the laboratory, but field development work is under way. (A detailed story on these developments appeared in *Chem. Eng.*, Nov. 1949, p. 120.)

E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del.

SYNTHETIC WAX:

Alkyl Stearamide

Ceramid is the name of a new synthetic wax that Glyco Products Co. is now turning out in commercial quantities. Chemically it is an alkyl stearamide. It is hard, light yellow in color and melts between 79.5 and 80.5 deg. C. Insoluble in water, it is more soluble in organic solvents than natural and other commercial synthetic waxes. Absolute alcohol will dissolve 5.4 g. per 100 cc. In toluene and naphtha 3.8 and 3.4 g. respectively can be dissolved.

This synthetic wax is compatible, in varying proportions, with asphalt, carnauba wax, cumarone resins, ethyl cellulose, microcrystalline wax, paraffin wax and Acrawax C.

Its use is indicated for protective coatings and films to be deposited on various surfaces out of solvent solution. It emulsifies readily to give a white matt finish that can be rubbed to give a high polish. It may be used as an anti-tack agent for resin organi-

(Continued)

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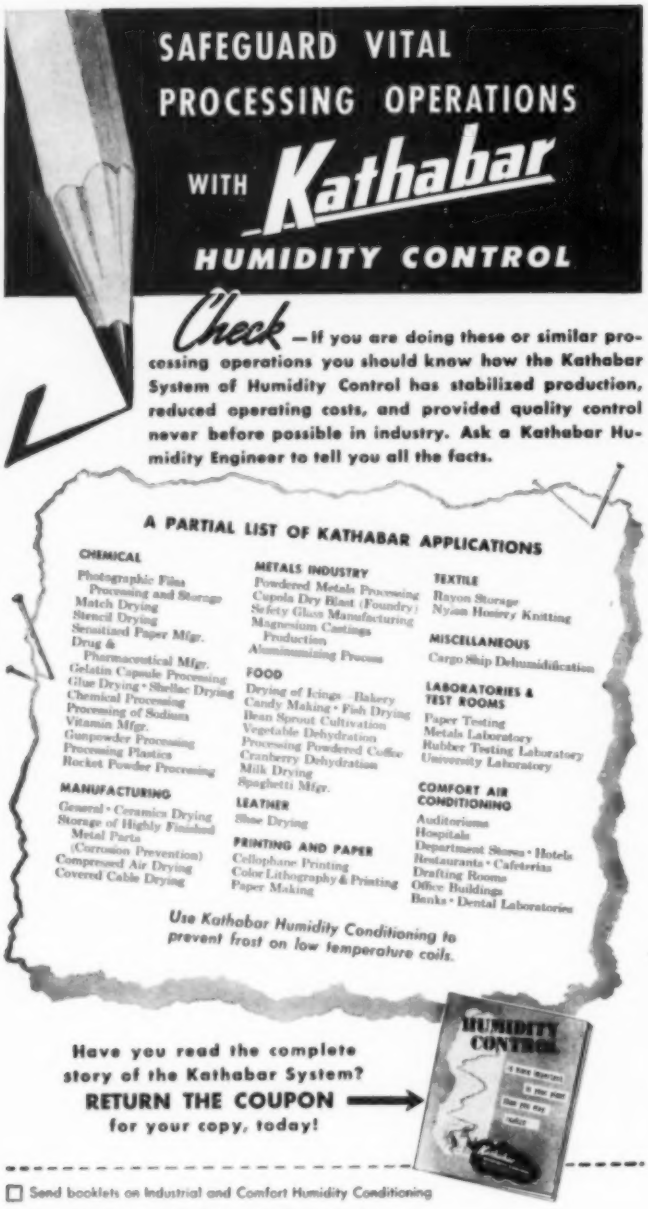

sols; as a mold lubricant for rubber and plastic goods and to prevent sticking of finished articles. In most lacquers and enamels it dissolves clearly and serves as a flatting or gloss reducing agent. In polishes and insulating compounds, it is used in blends with other waxes and hydrocarbons for special effects.

Ceramid can be used for waterproofing textiles, paper and leather. Since it is slower burning and higher melting than paraffin wax, it should be of interest in slower burning, dripless candles.

Its low price, 30 c. a lb. in drums, indicates its economy in replacing higher priced waxes.

Samples and further data can be obtained from the manufacturer.

Glyco Products Co., Inc., 26 Court St., Brooklyn, N. Y.

CUTS BRUSHING TIME:

Long-Oil Alkyd Resin

New vehicle for quality flat wall paints, marketed by U.S. Industrial Chemicals, Inc., is Aroflat 3010, a pure long-oil alkyd. Brushing time is cut by 25 percent. Wet scrub tests, using paints containing the resin, have shown resistance to washability five to seven times greater than nationally advertised flat wall paints tested. In darker colored flat paints, Aroflat 3010 does not scuff and chalk like other vehicles.

Using ASTM standards for testing brushability, the company investigators determined that Aroflat paints require only three-fourths of the time needed to apply conventional paints.

In tests using the Gardner wet scrub apparatus, to show comparative washability of flat wall paints, the first break-through of an Aroflat paint occurred at 3,620 double strokes. A well known flat wall paint, not using Aroflat, had an initial breakthrough in the same test at 770 double strokes, while a third paint, also without Aroflat, broke through at 500 double strokes.

Aroflat showed a "paint off" score of 9,530 double strokes, while "paint off" of the other paints tested was clocked at 3,370 and 1,380 strokes respectively. In this test, all films were applied with a 5-mil cylindrical applicator and were aged for nine days before the test.

Despite the fact that whites and light tints still make up the bulk of flat wall paints used, there is a current trend toward darker colors for interior walls. The demand has been for deep-tone flat wall colors, often

(Continued)

the trend is to TRENT

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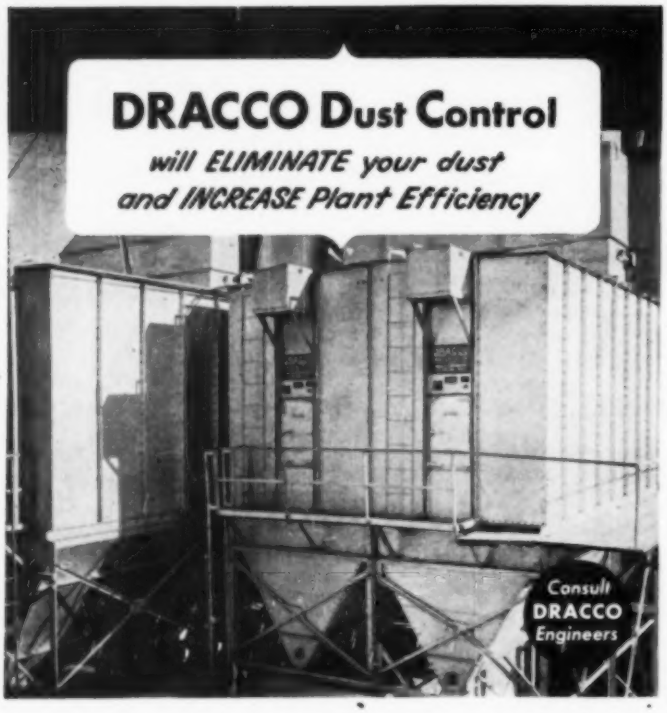

Dust, even in small amounts, reduces efficiency in ANY plant—and that is why it is so important to eliminate it. DRACCO Dust Control is saving millions of dollars each year because it increases plant efficiency by eliminating dust. Once installed the savings go on for years. DRACCO Dust Control reduces cost of maintenance and prolongs life of equipment; recovers valuable materials, and creates better working conditions that attract the better workers. Why not have DRACCO Engineers analyze your dust and fume control problems? They have the "know-how" gained from years of experience.

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4071 E. 116th St., Cleveland 5, Ohio New York Office: 130 W. 42nd St.

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PNEUMATIC CONVEYORS • METAL FABRICATION

referred to as mass tone matte finishes.

Aroflat simplifies the formulation of these darker colors due to its high scuff resistance and improved working properties. It helps to overcome one of the serious defects of deep-tone flats, now made with conventional vehicles, which is their tendency, when scuffed even slightly, to show chalk-like marks that appear unsightly against the dark background.

U. S. Industrial Chemicals, Inc., 60 East 42nd St., New York 17, N. Y.

FROM NEW SOURCE:

Animal Protein Factor

Commerical availability of Animal Protein Factor is announced by Chas. Pfizer & Co., Inc. The Pfizer product will be known as Bi-Con APF-6, a specially formulated biological concentrate for the feed industry.

Each pound of the concentrate contains the equivalent of 6.0 mg. of vitamin B_{12} activity, as determined by microbiological assay. Bi-Con APF-6 is biologically assayed for the proper growth of poultry and certain livestock. Normally, feed manufacturers obtain APF by using such protein sources as fish and meat scraps in feed formulations.

Marketing of APF as a commercial product is significant, since it will permit feed manufacturers to use less expensive and more readily available vegetable proteins for feed. Experimental evidence indicates that Bi-Con APF-6, when added to feeds in the ratio of 2 lb. per ton, produces responses in animals comparable to the usual animal protein diets.

Because of Pfizer's experience in fermentation and its high production capacity, APF will be offered to feed manufacturers at a price that will permit its widespread use.

Pfizer is continuing its work on the isolation of a purified vitamin B_{12} from APF concentrate, and will shortly offer a highly purified vitamin for pharmaceutical use. Vitamin B_{12} is the only pure chemical effective against pernicious anemia, nutritional macrocytic anemia and tropical sprue.

Chas. Pfizer & Co., Inc., 630 Flushing Ave., Brooklyn 6, N. Y.

STYRENE COPOLYMER:

Resin Emulsion Addend

A styrene copolymer resin emulsion addend that greatly improves floor wax is currently in production by American Resinous Chemicals Corp. By adding six parts dry weight of the resin emulsion to 100 parts any weight

(*Continued*)

GREAT NEWS FOR ALKYD MAKERS!

...says Mr. fatty acid

A NEW LIGHT-COLORED SOYA ACID WITH OUTSTANDING HEAT STABILITY

★ ★ ★

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For years they have been pretty well resigned to the sad fact that most alkyds darken in cooking . . . lose up to three or four colors in the finished product. For example: an alkyd made from an acid with a Gardner Color of 3-4 may wind up with a Gardner of 7-8.

Faced with this problem, ADM chemists developed RO-11-S, a high quality, light-colored soya fatty acid with excellent heat stability. Thus you can count on RO-11-S to offer remarkable resistance to darkening . . . to limit color loss to only one to two colors in cooking!

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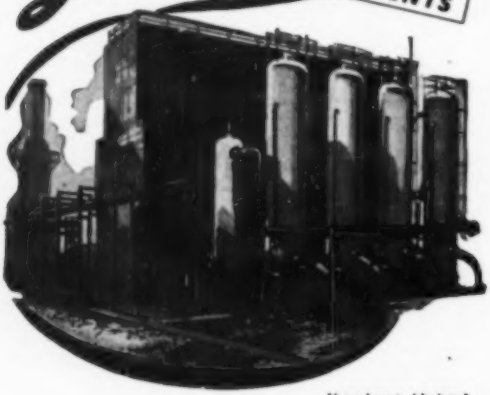

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of any standard emulsion wax, anti-slip properties are improved, color of liquid wax is lightened, wearing qualities increased and production costs lowered.

As an aid in formulating on a production basis, Arco 1071-6C, as it is called, is added directly to the floor wax emulsion. Sufficient water is then added to reduce the solids content to that specified.

Arco 1071-6C is supplied as a 32 percent solids emulsion weighing 8.75 lb. per gal. It has a pH of 10 to 11.

Shipments are made in carload, ten-drum, one-drum or less-than-drum lots. Samples or trial lots are available.

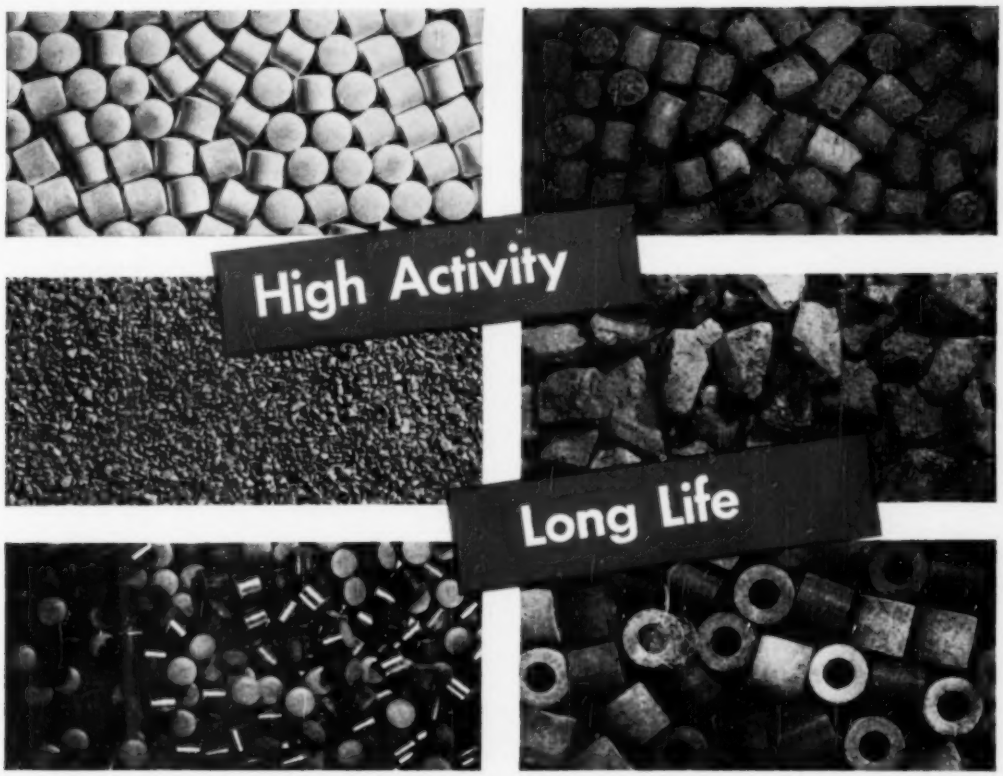
American Resinous Chemicals Corp., 103 Foster St., Peabody, Mass.

Briefs . . .

Choline salt in a new form, as choline dihydrogen citrate, is being turned out by Chemo Puro Manufacturing Co., Inc., after six months of research on the project. Because of the controlled particle size of this choline dihydrogen citrate, it can be fed directly into tabletizing machines. *Chemo Puro Manufacturing Co., Inc., 26-32 Skillman Ave., Long Island City, N. Y.*

Permanent pigment blue, or green shade phthalocyanine blue, has been added to the line of flushed colors offered by Hilton-Davis Chemical Co. to manufacturers of printing inks. Its standards are extremely clean and strong, and it is being used where permanence and resistance to alkali are called for. By flushing the material, more strength is developed than by grinding the dry color in equivalent quantities. Free-flowing flushed colors of Hilton-Davis are made possible by use of its new patented vehicle, a polyamine resinous composition. *Hilton-Davis Chemical Co., Langdon Farm Road, Cincinnati, Ohio.*

Anti-gelling agent, made by Glyco Products Co., Inc., and called Flovis, when added to starch pastes in amounts as small as 0.1 percent, will decrease viscosity and delay gelling. Use of Flovis in starch pastes gives creamier, smoother and softer products that are easier to use and to handle. No reduction in solids content is necessary to get better flow. In packaging starch adhesives the greater fluidity induced by Flovis enables faster packing and saves labor. It is being manufactured on a tonnage basis. *Glyco Products Co., Inc., 26 Court St., Brooklyn 2, N. Y.* —End



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Nickel Base Reforming Catalysts—used for the manufacture of hydrogen and synthesis gas from hydrocarbons. These catalysts are rugged, very active, and resist spalling. They show no tendency to promote the formation of carbon from light hydrocarbons.

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Water Gas Shift Catalysts—used for the conversion of carbon monoxide to hydrogen and carbon dioxide. These catalysts are highly active at low temperatures, resist breakage and dusting, and have a long life in service.

Desulphurization Catalysts—used for the conversion of carbonyl sulphide, carbon disulphide, mercaptans and thiophenese to hydrogen sulphide. These catalysts are long-lived and highly active.

Hydrogenation Catalysts—used for many hydrogenation processes. These catalysts are highly active with good stability, and long life in service.

Special Catalysts are available for the removal of oxygen, hydrogen, and carbon monoxide from gas streams.

The Girdler organization offers a comprehensive service for the study of special catalysts problems. Extensive and thoroughly modern laboratory and technical facilities are available for development and testing procedures.

A thorough understanding of chemical processes and long experience in the manufacture and use of catalysts are important features of Girdler's catalyst service.

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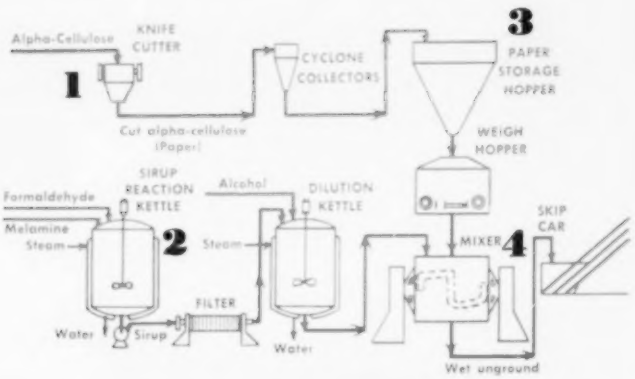

Melamine and Urea Resins

Article on page 88. Photos by S. E. Karson and B. W. Murray

From American Cyanamid's big $9 million plant at Wallingford, Conn., largest of its kind in the world, come a whole raft of urea and melamine resins and molding powders. Bulk of production is turned out by the two major units: the spray dryer plant and the molding powder plant.

In the molding powder plant, which can produce over 2 million pounds a month, either urea or melamine is reacted with formaldehyde in a kettle to form the liquid resin, which is then filtered. Next, alpha cellulose is impregnated with liquid resin in a stainless mixer. The damp material is dried in an oven dryer. Further condensation of the resin occurs in the dryer. During grinding in a ball mill the pigments, mold lubricants and curing agents are added. Then the ground material is screened and sifted. If densifying is called for, the material goes through a Banbury mixer. Finally, the molding powder is cut, passes over a vibrating cooler-conveyor and is drummed as finished product.

In the spray dryer plant, capable of turning out over 3 million pounds a month, the condensation reactions of urea or melamine with formaldehyde to form liquid resins are likewise carried out in stainless kettles. But drying is accomplished by spraying the resin droplets into the chamber of a spray dryer, where heat from a mixture of combustion gases and air dries the resin to a fine dust. Powdered resin is conveyed by the gas stream, under the draft of the main fan, over a bank of cyclone collectors. A secondary air stream collects resin dust from the bottoms of these cyclones and carries it to the final collector. Thence it passes through a Mikro-Pulverizer and into ribbon blenders, which also function as weigh tanks. Filler is added, the material blended, weighed and packaged, and the finished spray-dried resin is ready for shipment.

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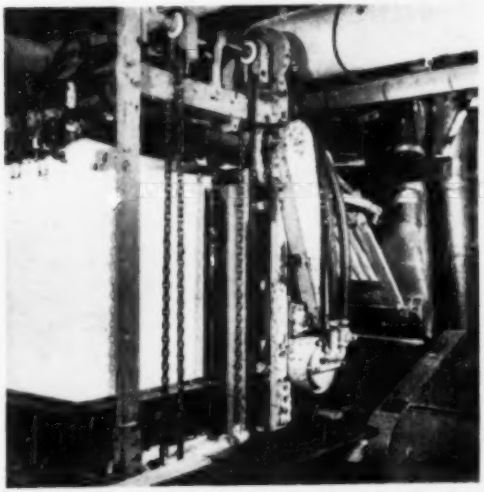
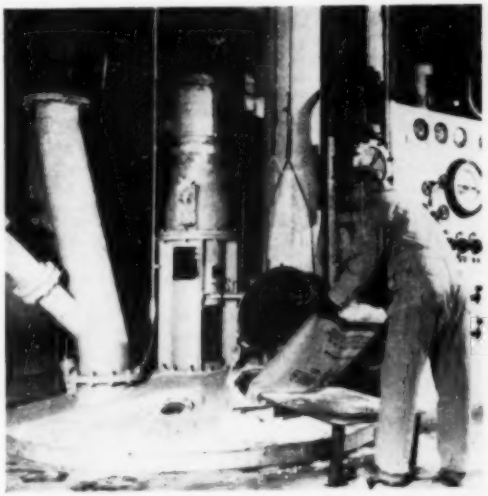
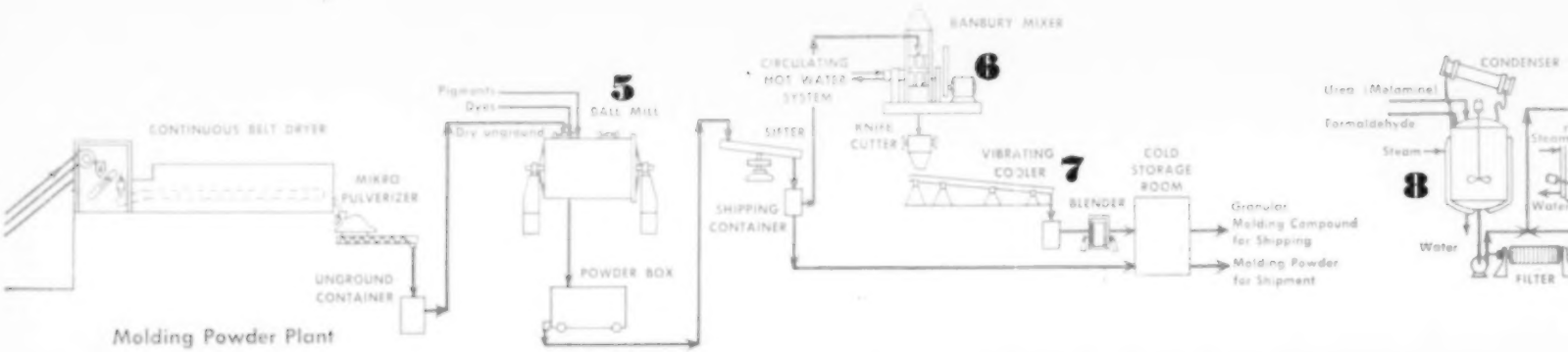
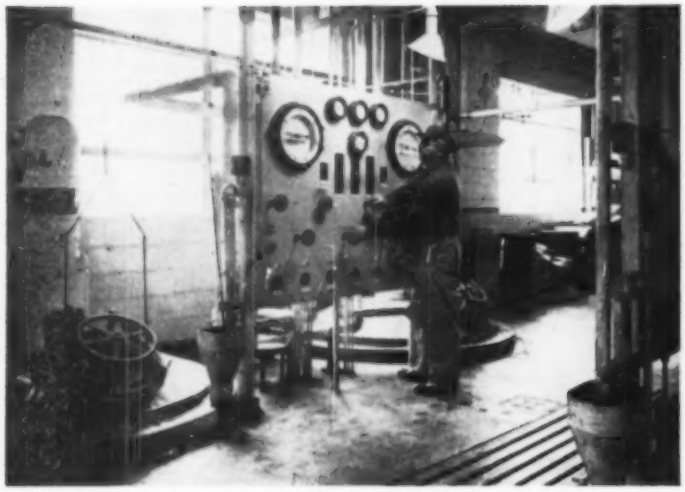


1 In molding powder plant, sulphite pulp, source of cellulose filler, is fed automatically into knife cutter.

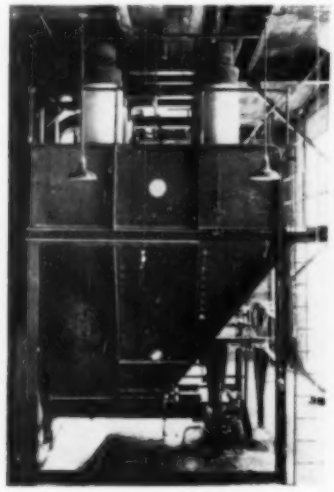


3 Resin making begins in spray dryer plant as operator charges urea to kettle. Melamine is charged same way.

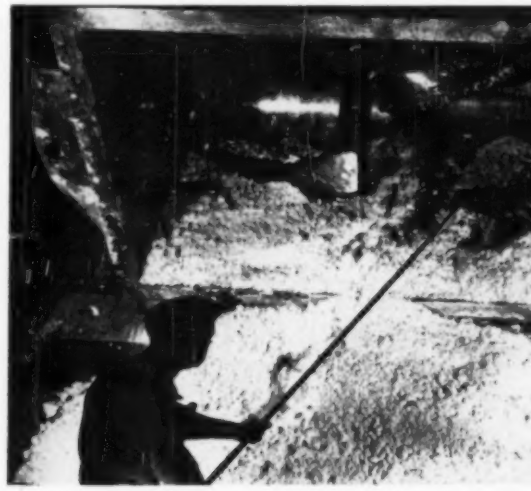




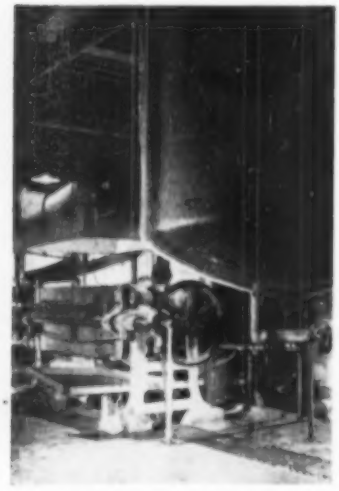
2 Either urea or melamine is reacted with formaldehyde in these kettles to form liquid resin or sirup. Operator carefully controls course of condensation.



3 Cut pulp stored in this hopper is added to liquid resin in mixer.



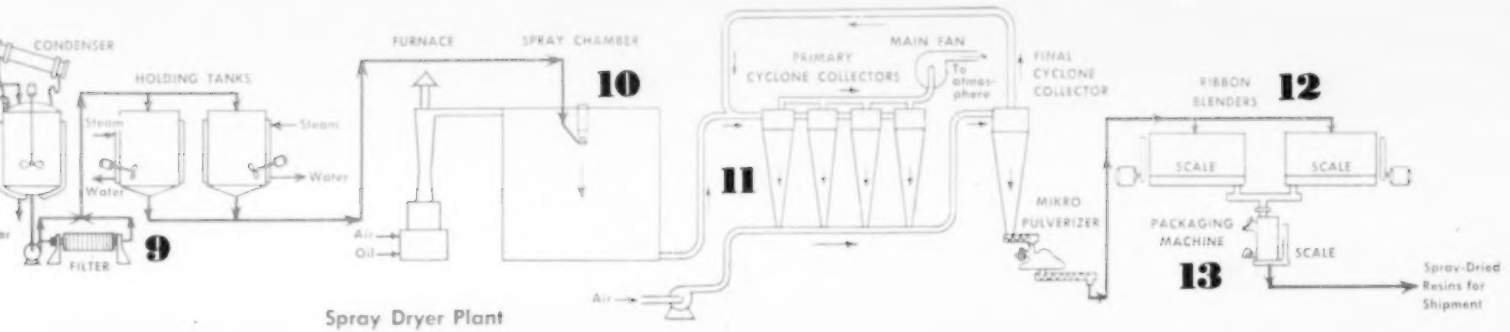
1 Cellulosic filler impregnated with liquid resin is scraped from mixer into skip-hoist car that carries it to screener and oven dryer.



9 Liquid resin from kettle is clarified by running it through filter press.

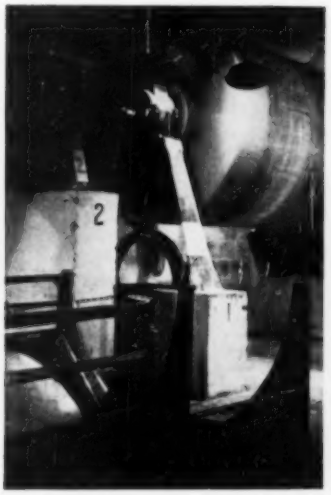
10 In these spray dryers the ticklish drying operation takes place. Fine droplets of liquid resin sprayed into chamber are dried to fine powder or dust by heat from the mixture of hot combustion gases and air. Each dryer has direct-fired furnace.

11 Under draft of n and over this ban



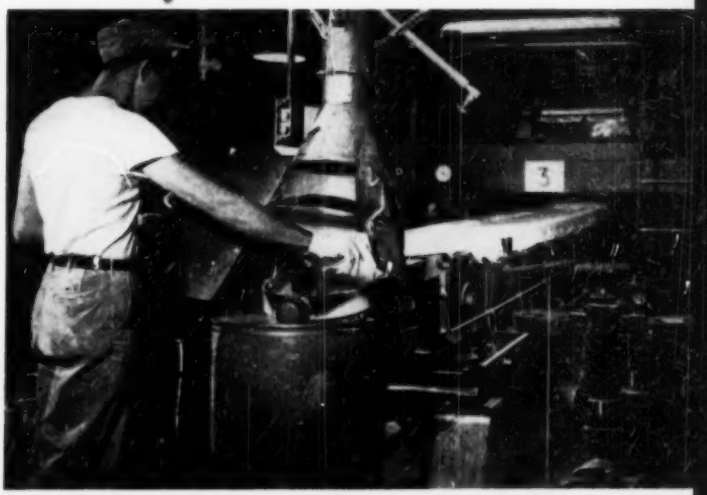
Spray Dryer Plant

s scraped from double-arm open and oven dryer.

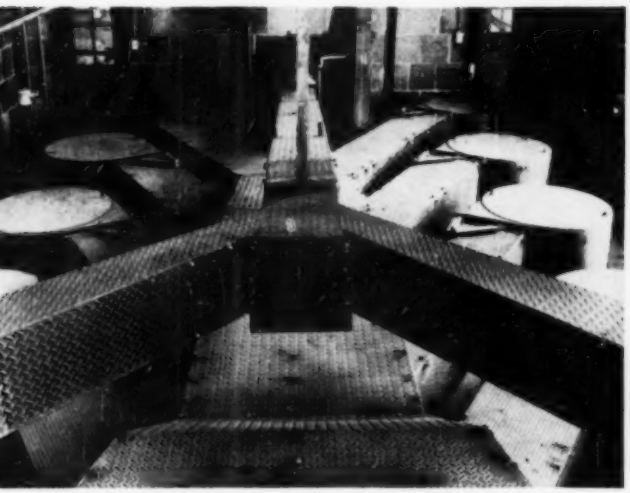


5 After drying, material is ground and blended in a big ball mill.

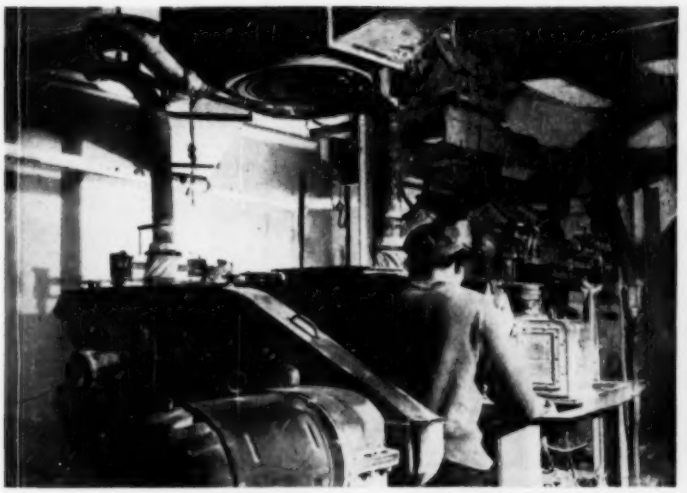
6 Densifying in Banbury mixer doubles absolute density of powder.



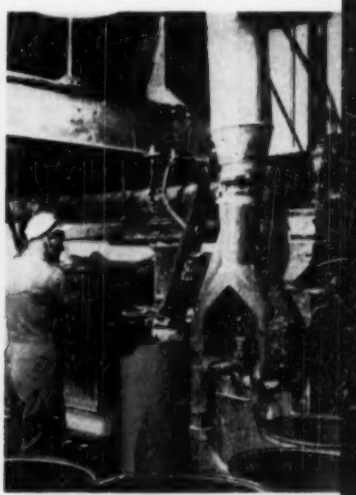
7 Finished molding powder coming from knife cutters moves down this vibratory cooling conveyor to dust hood under which it is drummed.



Under draft of main fan, gas stream conveys dried resin dust from spray chamber and over this bank of cyclones. Powdered resin collects in their bottoms.



12 Resin drops into this ribbon blender, which also functions as a weigh tank. From here it goes into bigger water-jacketed blender, where filler is added.



13 Here finished product is either bagged or drummed.

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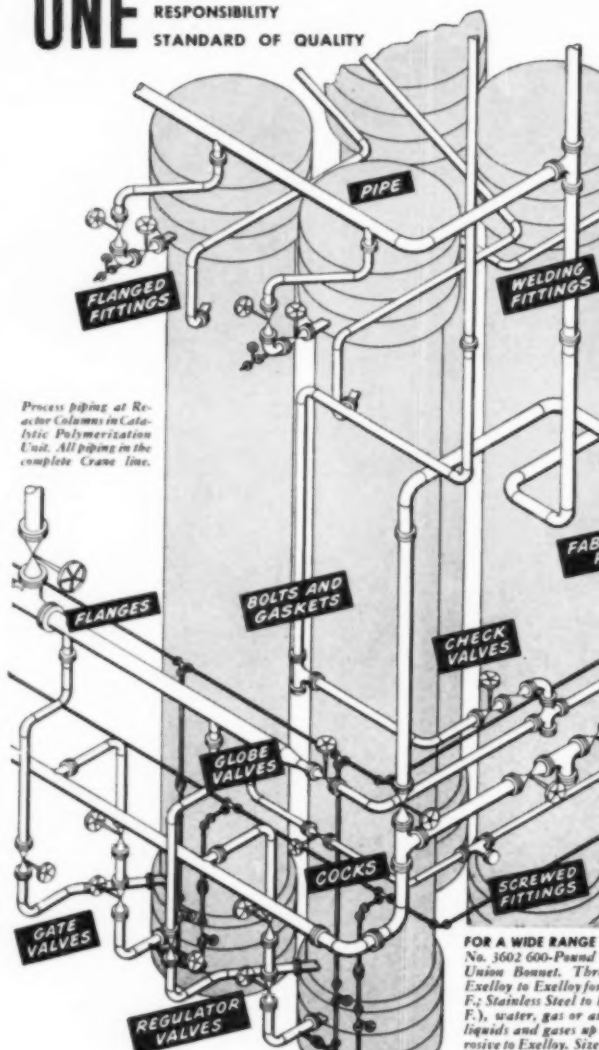

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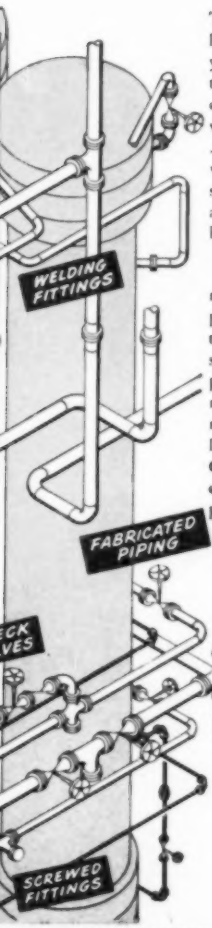

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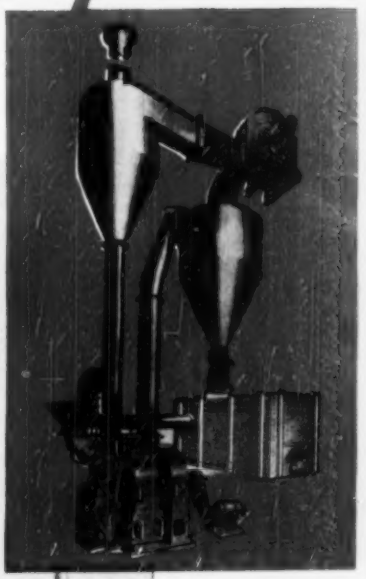

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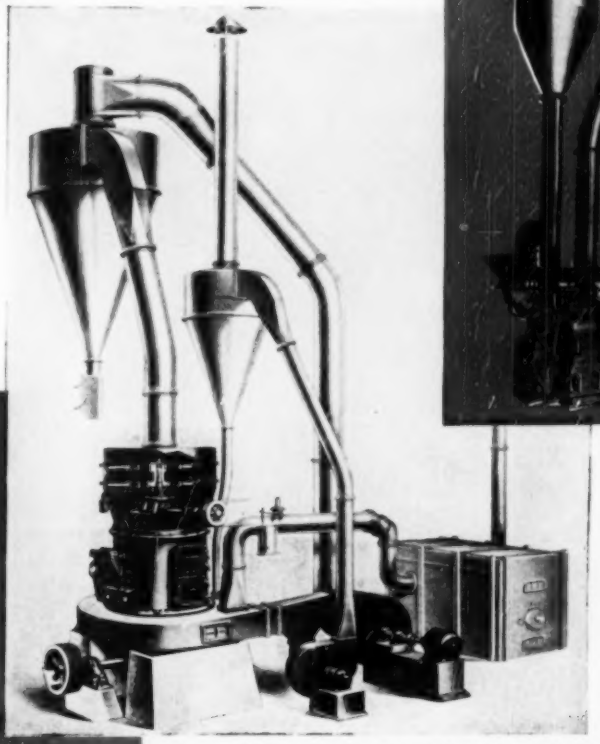

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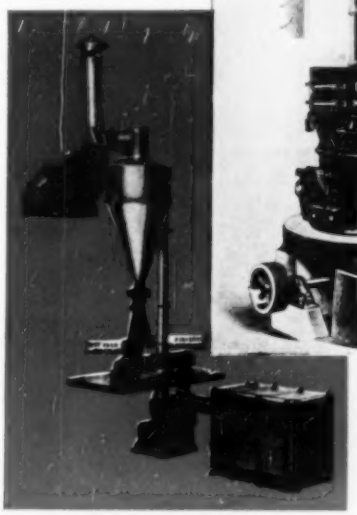

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SINCE 1887

Chemical Engineering News

JOSEPH A. O'CONNOR, News Editor

Marathon Opens New Central Research Laboratory

Both fundamental and applied research pertaining to the products and processes of the Marathon Corp., particularly those relating to wood, pulp, paper and lignin products, will be carried on at the new central research laboratory just opened at Rothschild, Wis., according to Allen Abrams, vice president in charge of research.

The new building is constructed of structural steel, reinforced concrete and brick, with Indiana limestone trim. Windows are hermetically-sealed double glass, for insulation, and the building is air-conditioned. Aluminum hardware and metal work is used throughout the building. Floor covering is a light gray asphalt tile. Fluorescent lighting provides 50 foot candles of light at the working surfaces in laboratories and offices. Laboratory furniture is constructed of birch in a golden brown finish. Table tops have treated wood surfaces to resist attack by chemicals and solvents. Principles of color harmony employed in decorating the building produce a pleasing appearance and enhance functionality of the laboratory.

There are three floors, each containing about 8,000 sq. ft. The first floor houses the constant temperature and humidity room, a machine shop, storage facilities and two pilot plants, of which one is two floors in height. The second or main floor is reached through the front entrance. A mural in the reception room depicts the application of science to the pulp and paper industry. On the same floor are the conference room, library, offices and two laboratories.

The third floor has three offices and a storeroom, the remaining space being occupied entirely by laboratories equipped for work in organic, analytical, physical and biological chemistry.

Ohio Plant Hits Full Stride In Beta-Naphthol Production

With all the bugs out at last, the new beta-naphthol plant of Hilton-Davis Chemical Co. at Cincinnati is running at full clip. Its rated capacity: 5 million pounds a year. Bulk of the beta-naphthol will be used by Hilton-Davis, a subsidiary of Sterling Drug Inc., in its own production of red pigments and azo dyes for the printing ink, varnish and textile industries. And there is a ready market for any surplus.

The beta-naphthol will be gobbled up in the making of some 60 organic pigments, including Lithol Reds, Red Lake C, Fire Toner and Toluidine. Hidacid Orange II, an azo dye, is also being produced from the same raw material, as is the intermediate tobias acid.

Shipments of surplus are going out in 65-lb. bags, packed dry, to other manufacturers of pigments and dyestuffs.

More than 100 different pieces of equipment, each custom-built for Hilton-Davis, are involved in the manufacturing process. Naphthalene, sulphuric acid and caustic soda are the basic raw materials entering the reactions that produce the finished beta-naphthol.

Radioactive Materials Key To Textile Dyeing Process

First successful commercial use of radioactive materials in industrial production is a new textile dyeing and finishing process, which may foreshadow important applications in other industries. Initial run came recently at the Paterson, N. J., plant of Shamrock Textile Processing Co., where the first successful dyeing of acetate fabrics in vat colors was achieved.

Through the use of a new addition agent, designated as catalyst UA-1, which is manufactured from radioactive source materials, the Vat-Craft Corp. has developed a method that permits use of photochemistry for the first time in the dyeing and finishing of all types of textiles.

It took Leonard E. Ravich, Vat-Craft's vice president in charge of research, two and one-half years to develop the process under a license from the U. S. Atomic Energy Commission.

The new process not only employs radically different equipment that requires far less space than the equipment in normal finishing plants but also completely dyes, finishes and dries the fabric in one operation at a reported speed of 300 yd. a min.

A normal finishing plant, using regular dyeing operations, is able to finish 90,000 yd. of fabric in two 10-hr. shifts, with about 70 men employed. In a test run, Shamrock's plant, using the new process and new equipment, turned out about 130,000 yd. of completely dyed fabric in a corresponding period, but with only a handful of operators at work.

Working with Vat-Craft over the past two and one-half years has been the American Viscose Corp., which put the facilities of its textile research department at Marcus Hook, Pa., to work in the engineering, testing and evaluating of the new process. Col-

(Continued)

laborating with Vat-Craft on the development of the first production machine was Proctor & Schwartz. General Electric Co. manufactured the special lamps required to develop the colors, while Corning Glass Works supplied the 96 percent silica glass needed for the development chamber. And the Van Vlaanderen Machine Co. designed the special dye padders used in the process.

The process involves application of vat colors in specially prepared form to the fabric, after which sensitizers and catalysts are added before the colors are developed photochemically.

In the Vat-Craft process fibers are coated or impregnated with soluble materials that, upon exposure to radiation, are converted to insoluble colored pigments. These become an integral part of the fabric or sheet and impart to the base a permanent color that cannot be removed by any means.

To pay its way, the process must proceed at high speed. To this end, addition agents are included in the solution coated on the sheet or web materials. The addition agents act like a radio amplifier that takes small amounts of electrical energy and increases and converts this energy to a state easily perceptible, such as the sound waves from a loud speaker.

It has been found that exceedingly small amounts of the catalytic addition agent UA-1, when added to the solution coated on the sheet or web base, will increase the efficiency of outside radiation many thousand times, to a point where color can be precipitated on any material at high speed.

Process Equipment Dealers Form Their Own New Group

First formal meeting of the Chemical Machinery Men's Club at the Hotel Statler in New York last month marked the realization of an idea conceived by Fred. R. Firstenberg, president of First Machinery Corp.

For years Firstenberg has been trying to organize such a group for men engaged in the highly competitive process equipment business. Now, with the help of other equipment firms, he has finally succeeded.

Among firms represented at the inaugural meeting were Brill Equipment Co., Consolidated Products, Emsco Equipment, R. Gelb & Sons, Inc., Chemical & Process Equipment Co., Stein Equipment Co., Machinery & Equipment Co., Perry Equipment Co., L. Kehoe Machinery Co., Loeb Equipment Co., Union Standard Equipment Co., Eagle Industries, Hirsch Equipment Co., First Machinery Corp., Storms-Harvey Inc., L. Firstenberg Supply Co. and Equipment Clearing House, Inc.

Machinery dealers all over the country have tumbled to Firstenberg's idea and membership is expected to snowball.

NOBEL WINNER

William F. Giauque of the University of California is the winner of this year's Nobel prize in chemistry for his studies of the behavior of matter at temperatures close to absolute zero. He stands beside container of boiling liquid nitrogen in his laboratory at Berkeley just after being told he had won the Nobel award. Liquid nitrogen is used by Dr. Giauque in his work.

Contact Acid Plant Source Of SO_2 for Tennessee Unit

Tennessee Copper Co. is putting up a new liquid sulphur dioxide plant at Copperhill, Tenn., which is slated to be running early in 1950. Its rated capacity: 25 tons of sulphur dioxide a day.

The plant is located next to a contact sulphuric acid plant, and it will use sulphur dioxide from the cleaning system of the acid plant. The gas will come from roasting and sintering operations employed in treating iron sulphide flotation concentrates.

Shipments will be made in multi-unit tank cars, as well as in cylinders of various sizes.

Unique Pittsburgh Clinic To Study Stainless Valves

What is believed to be the country's first stainless steel valve clinic will be held at a dinner meeting on Thursday evening, Jan. 12, 1950, at the William Penn Hotel in Pittsburgh, Pa. Cooper Alloy Foundry Co., Hillside, N. J., is the sponsor.

All kinds of stainless steel valves will be discussed. Application, design features and maintenance problems will be thrashed out. A unique comparative study of competitive stainless valves will be made. Corrosion-resistant materials utilized in stainless valve manufacture will be discussed in detail. A round table session, with buyers and users of valves taking an active part, will follow the presentation.

Only those in the Pittsburgh area who are engaged in specifying, purchasing or maintaining stainless steel, nickel or Monel valves will be admitted to the clinic. To emphasize the educational character of the session, no sales representatives, not even members of Cooper Alloy's nationwide distributor chain, will be invited. Invitations can be secured free on a first-come-first-served-basis from Cooper Alloy in Hillside.

Boilers Put Through Paces To Provide Maximum CO_2

Running a boiler to get a maximum of carbon dioxide in the flue gases and obtaining steam only as a byproduct of the generating process sounds somewhat unusual. But this is just what Pure Carbonic, Inc., does at its Chicago plant, where dry-ice is manufactured from CO_2 in the flue gases by the Girbotol process. Capacity of the

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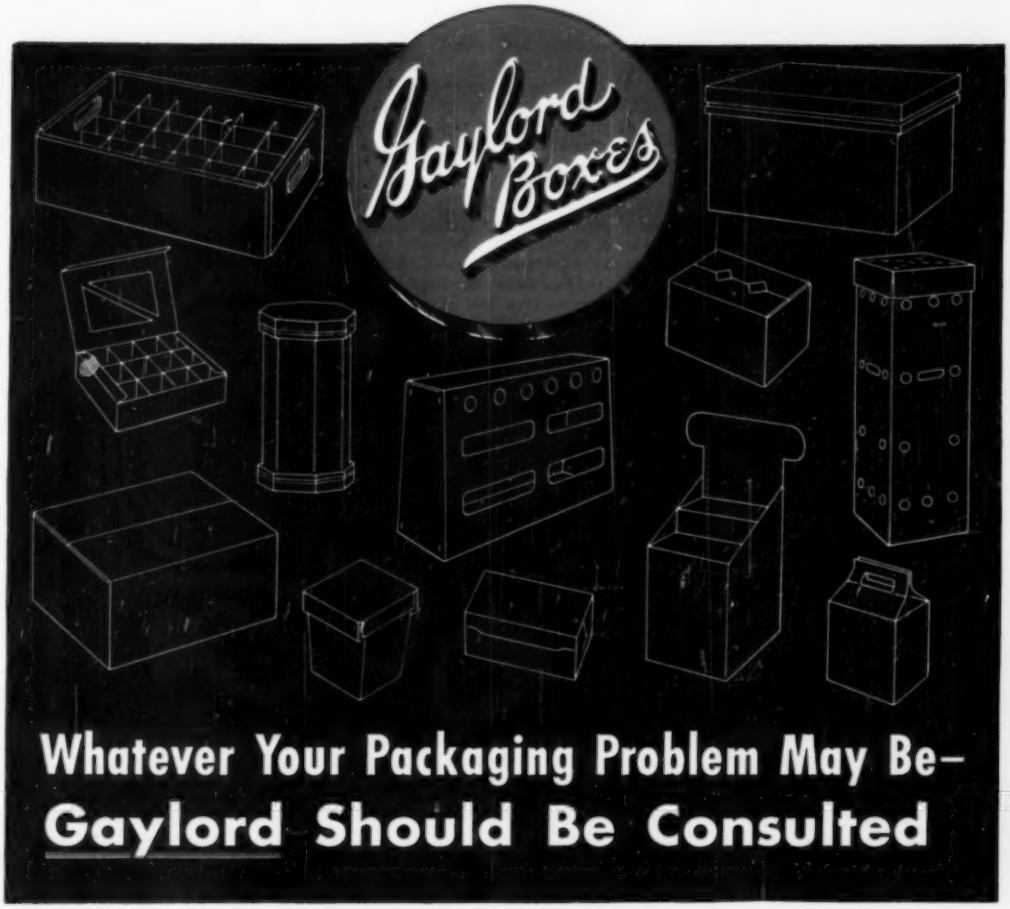

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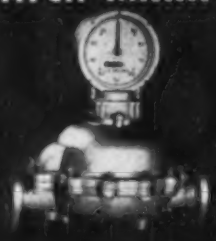

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plant exceeds 140 tons of dry-ice a day.

To permit maximum extraction, the CO_2 in the flue gases is carried as high as possible. This is done despite some sacrifice in boiler efficiency, inasmuch as the steam is only a by-product. It is used to drive auxiliary equipment and for plant heating.

With the idea of boosting the daily output, tests were run recently to determine equipment capacity. Accordingly, for two weeks the largest boiler was operated at a load 20 percent in excess of its maximum continuous rating. During this time the CO_2 ranged from 17 to 18 percent, with a corresponding efficiency of 65 percent. When it is considered that this efficiency refers to the byproduct steam output alone and that the primary product is maximum carbon dioxide, with extraction up to 90 percent, the exceptional performance of the steam-generating unit may be more readily understood.

Visual inspection of the boiler, when taken off the line at the conclusion of the test, indicated less slagging than is experienced under usual operation and no adverse effects upon the refractory parts of the setting.

Tankers With Caustic Aboard To Make Port in Charleston

Dow Chemical Co. has signed a long-term contract with the South Carolina Ports Authority to use a new $100,000 installation, to be constructed at Charleston, for the storing and handling of liquid caustic soda.

The Ports Authority will construct the installation, which will have a capacity of 4,000 tons. It will be in operation early in 1950. McPherson Co. of Greenville, S. C., is supervising construction.

Dow will bring the chemical into port at Charleston in special tankers from its Freeport, Tex., plant. This will be the first water movement of caustic soda to the Southeast. It is estimated that 2,000 tons a month will be discharged at Charleston.

Longview to Make Butyric By Modified Oxo Process

Tennessee Eastman Corp., subsidiary of Eastman Kodak that turns out acetate rayon, plastics and chemicals, is going ahead with work on the first unit of a hydrocarbon chemical plant on a 2,500-acre site near Longview, Tex.

The site is near one of the largest reserves of oil and gas in the area near the Louisiana border.

Tennessee Eastman will first produce synthetic butyric acid on a moderate scale by a modification of the Oxo process, a method of high-pressure synthesis developed at Kingsport, Tenn.

Butyric acid is becoming more and more important as a raw material for making cellulose butyrate plastic, which has certain properties superior to those of cellulose acetate plastics. Demand for this material for non-flammable film is increasing. There is no other big producer of butyric acid at present.

Main idea behind the Longview plant, however, is to provide Tennessee Eastman with a low-cost source of its raw materials and to expand fa-

(*Continued*)

CONVENTION CALENDAR

American Chemical Society, Division of Industrial and Engineering Chemistry, Columbus, Ohio, December 29-30.

American Association for the Advancement of Science, Chemistry Section, annual meeting, Hotel Statler, New York. December 30-31.

American Meteorological Society, 30th anniversary and 104th national meeting, air pollution symposium, St. Louis, Mo., January 3-6.

Society for Applied Spectroscopy, spectrographic analysis of molecular fragments, Socony-Vacuum Training Center, New York, January 10.

Society of the Plastics Industry, Reinforced Plastics Division, fifth annual technical session, Hotel Cleveland, Cleveland, January 10-12.

First Plant Maintenance Show, Auditorium, Cleveland, January 16-19.

Compressed Gas Association, Waldorf-Astoria Hotel, New York, January 23-24.

Southwest Air Conditioning Exposition, Fair Park, Dallas, Tex., January 23-27.

American Society of Heating & Ventilating Engineers, 56th annual meeting, Dallas, Tex., January 23-27.

American Standards Association, seminar on industrial standardization, Engineering Societies Building, New York, January 23-27.

Chemical Market Research Association, Statler Hotel, Detroit, February 2.

American Institute of Chemical Engineers, regional meeting, Rice Hotel, Houston, February 26-March 1.

American Society for Testing Materials, committee week and spring meeting, William Penn Hotel, Pittsburgh, Pa., February 27-March 3.

Drug, Chemical & Allied Trades Section, New York Board of Trade, 24th annual dinner, Waldorf-Astoria Hotel, New York, March 9.

National Plastics Exposition, Navy Pier, Chicago, March 28-31.

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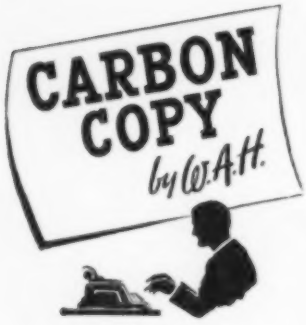

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cilities for its chemical business. Tennessee Eastman has many things under wraps that will be made later at Longview.

Production of acetic acid, a major raw material for Tennessee Eastman's yarn and plastics, in Texas is not contemplated. The Kingsport plant has the capacity to produce enough acetic acid from synthetic alcohol.

Koppers Subsidiary Builds Pipeline Coatings Plant

Construction and operation of an industrial protective coatings plant at Port Arthur, Ontario, is planned by the By-Product Coke Co. of Canada, Ltd., a wholly owned subsidiary of Koppers Co., Inc. Annual capacity of the plant will be 25,000 tons.

Coal-tar-base coatings produced at the plant will be applied to pipelines transporting oil and natural gas from the rich Alberta oil fields, according to General Brehon Somervell, president of Koppers. Initial contracts call for delivery of 15,000 tons of enamel coatings for application on the Edmonton, Alberta, to Duluth, Minn., pipeline of Imperial Oil, Ltd., and an associated company in the United States.

By-Product Coke Co. has arranged with Northern Wood Preservers, Ltd., of Port Arthur, for leasing of a site for the erection of the plant and for the purchase of paint-base pitch and other raw materials to be used at the plant. Barring hitches, the plant should be in full operation by the end of January 1950.

CSC Shells Out $2 Million To Expand Research Center

A $2 million addition to its research center, which more than doubles previous facilities, has been put into operation by Commercial Solvents Corp. at Terre Haute, Ind.

The new laboratories, dedicated to Major Theodore P. Walker, chairman of the board, were opened by Henry E. Perry, president, who formally turned the facilities over to T. S. Carswell, vice president in charge of research and development, and Jerome Martin, research director.

Opening of the new research center is the latest step in a research expansion program that has led to the increased diversification of the operations of Commercial Solvents. While intensive chemical research will be continued by Commercial Solvents, the new facilities will also be devoted to studies of antibiotics and other pharmaceuticals. The research staff has been increased to 300 employees.

The original research building has been altered to supply added working area, and has been more than doubled in size by the addition of a wing that contains laboratories, offices, instrument rooms, work shop and service units.

A new two-story bacteriological pilot plant has been completed. Six 1,500-gal. steel fermenters with cookers and coolers, as well as six 400-gal. fermenters, have been installed, together with air sterilizing equipment and other essential apparatus. Provision has also been made for anaerobic fermentation equipment. A control laboratory, as well as processing area and equipment and finishing rooms, for products of a nature requiring sterile handling are included.

A pharmacological laboratory, another building of the group, is completely air-conditioned and contains laboratories, animal rooms and runs on the outside of the building.

Work Starts in Maine on Ammonium Sulphate Plant

Construction of an amonium sulphate plant at Searsport, Me., for Northern Chemical Industries, Inc., has just been started. To cost almost $200,000, the plant will have an annual output of 25,000 tons.

American Industrial Development Corp. designed the plant, which employs the Kuhlmann process. Graver Construction Co. is building the plant.

Northern Chemical Industries is a subsidiary of Summers Fertilizer Co., Inc., Baltimore fertilizer manufacturer.

American Industrial Development Corp. is also actively engaged with Kuhlmann processes in other fields. Among them: manufacture of ordinary and triple superphosphate by a continuous process, making of ammonium sulphate from gypsum, production of high-grade fertilizers by direct action of nitric acid on phosphate rock, making of sulphuric acid, chemicals from oil and coal, and production of ethylene derivatives. Etablissements Kuhlmann, with headquarters in Paris, is a big gun in Western Europe's chemical industry.

Monsanto Acquires Site for Resin Plant on West Coast

A small plant site at Santa Clara, Calif., has been purchased by the Western Division of Monsanto Chemical Co.

Why did Monsanto make this move? Need for manufacturing facil-

(*Continued*)

YOU PAY MORE THAN EVER TODAY, in wages and material costs, for every operation in your plant—including valve maintenance. But because individual valves are inconspicuous, it is easy to overlook their sizable share in the extra "cost-of-operating bonus" you must pay to stay in business.

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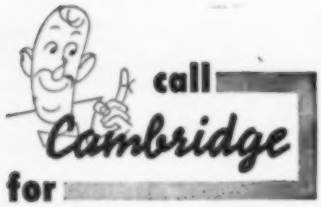

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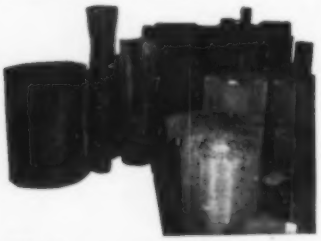

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ities in the San Francisco Bay area prompted the purchase, according to Irving C. Smith, general manager of the Western Division. Monsanto seeks to improve its service to the rapidly growing market in that area.

Bids have been received and construction will begin in the near future. The plant will turn out synthetic resins and specialty coatings for the California market.

Zirconium Compounds for AEC Made by Ohio Firm

Brush Beryllium Co. has started experimental production of zirconium compounds at its Lorain, Ohio, plant.

The plant, idle since a fire swept it about a year ago, has been completely renovated. The one remaining chemical unit in the plant is being used for the experimental work.

Brush Beryllium is doing this work as a contractor for the Atomic Energy Commission. The experimental program is expected to take four to six months to complete.

Shamrock Builds New Unit For Cracking and Reforming

At its Sunray, Tex., refinery Shamrock Oil & Gas Corp. is constructing a Perco Cycloversion unit. Designed capacity of the unit is 1,500 bbl. a day.

When it is completed early in 1950, the unit will be operated for both gas oil cracking and naphtha reforming. Shamrock has designed the catalyst chamber sections for completely automatic valve control.

Houdriflow Cat Cracker For Perth Amboy Refinery

As part of a major construction program at its Perth Amboy, N. J., plant, the California Refining Co. will have a Houdriflow catalytic cracking unit installed. The unit will be able to handle 25,000 bbl. a day.

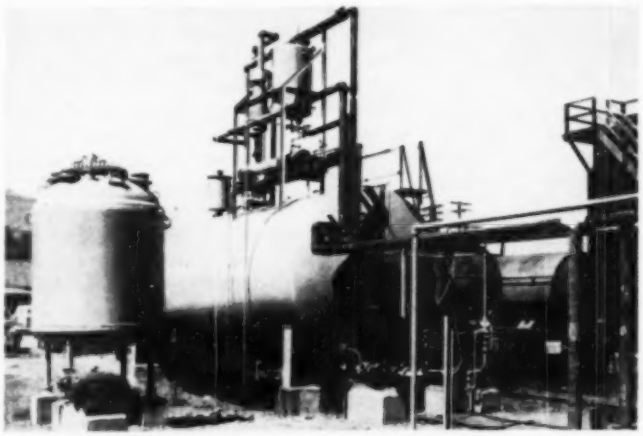
The new Houdriflow unit will be California Refining's first catalytic cracking installation. It will be the seventy-seventh catalytic cracking unit licensed by Houdry Process Corp.

Lion Oil Ups Ammonia Output at El Dorado

Its $3.5 million project for the expansion of ammonia production at El Dorado, Ark., has been completed by Lion Oil Co. As a result, production of anhydrous ammonia has been upped from 440 tons a day to better than 570 tons a day, the designed capacity.

In addition to the ammonia plant expansion, Lion Oil has shelled out another $3 million for a new contract sulphuric acid plant, an ammonium sulphate plant and an ammonium nitrate prilling plant. All of these units

(*Continued*)



TOLUENE DEHYDRATION AND STORAGE UNITS

These units at the new $1 million plant of Tennessee Products & Chemical Corp. at Chattanooga, Tenn., are equipped so that toluene in arriving tank cars is completely dehydrated. The 20,000-gal. storage tank has an automatic breather and a flame arrester. In processing benzyl chloride, about 50 percent of the toluene is not converted and is returned to the 1,500-gal. glass-lined storage tank. From the storage tank the unconverted toluene is pumped continuously back to the plant where benzyl chloride is processed.

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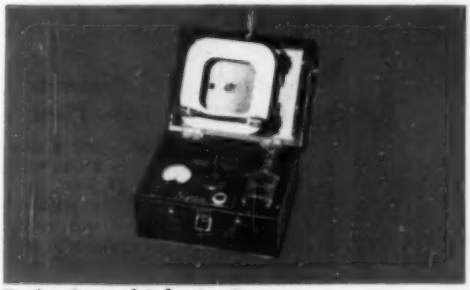

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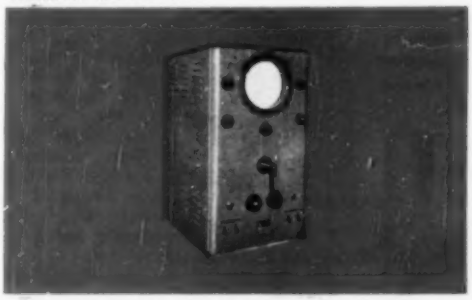

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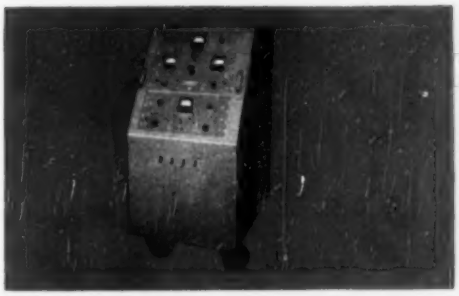

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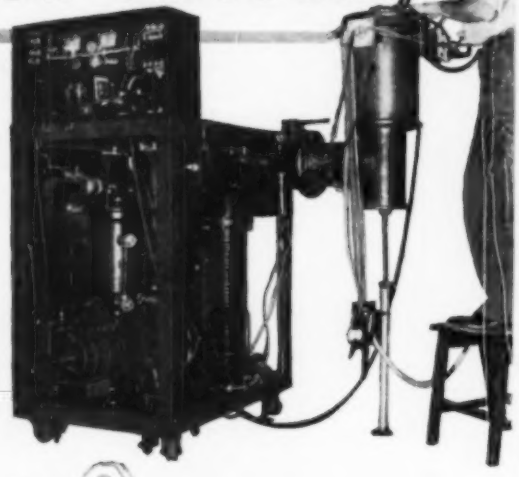

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NATURE'S VAST RESOURCES OF TITANIUM

Titanium — the wonder metal — is the 4th most abundant structural metal on earth. But for nearly 150 years titanium as a metal had been just another laboratory curiosity. The vacuum pilot plant shown in operation at Remington Arms Company, Inc., is now melting high quality titanium metal. Kinney High Vacuum Pumps are used in the operation.

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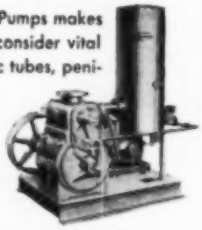

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are expected to be running this month.

The acid plant will burn 100 tons of sulphur a day and produce 300 tons of sulphuric daily. Except for small quantities going into other processing operations, this acid will be used in making 380 tons a day of commercial grade ammonium sulphate.

Bakelite Awards Contract For Work on Ohio Plant

Bakelite Corp. has signed a contract with F. H. McGraw & Co., engineers and contractors of New York, Chicago and Hartford, for work on excavations, foundations and underground piping for Bakelite's new phenol plant to be erected near Marietta, Ohio.

Work on the new project will get under way immediately, and is expected to be completed in the early part of 1950.

Donald W. Neville, McGraw vice president, and A. A. Persson of McGraw's Chicago office will be in charge of the project.

Revamped Cat Cracker Goes On Stream in Oklahoma

Its $8 million expansion program completed, Continental Oil Co. put the revamped units at its Ponca City, Okla., refinery on stream this month. This expansion boosts the crude-oil processing capacity of the refinery from 33,000 to 52,500 bbl. a day.

Continental's Thermofor catalytic cracking unit has been completely modernized. This unit was the first aviation-gasoline plant completed in Oklahoma. Continental leased the plant from the government during the war and afterwards purchased it.

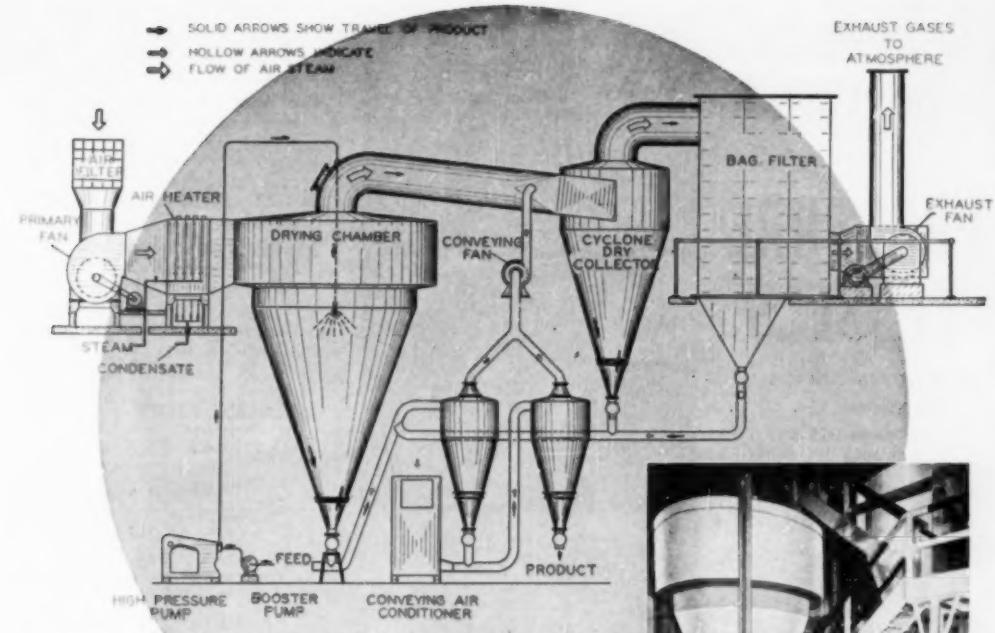
President L. F. McCollum states that Continental has long-range plans for expanding its facilities and intensifying its activities in the Southwest, Midwest and Rocky Mountain region.

Briefs . . .

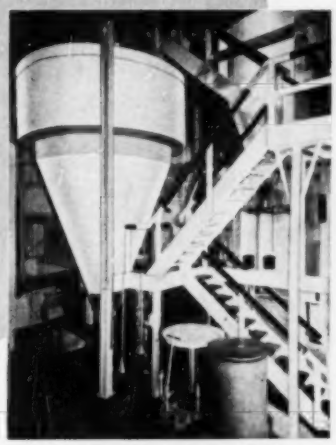
Ozark-Mahoning Co. is just getting its perlite products plant at West Tulsa, Okla., into operation. Perlite goes into plaster, cements and paints. Its production will diversify activities of Ozark-Mahoning, a supplier of mineral acids.

Phillips Petroleum Co.'s President K. S. Adams has announced completion of final steps in the merger of Wasatch Oil Co. with Phillips. It is anticipated that all Wasatch

(*Continued*)



EQUIPMENT FOR SPRAY DRYING HIGH-VALUE PRODUCTS



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installations will continue to be manned by present personnel.

Pan American Refining Corp. will erect a $250,000 desulphurization unit at its Texas City, Tex., plant. The unit is designed to remove sulphur from crude oils. Construction will begin immediately. Operation should come in first-quarter 1950.

American Polymer Corp. now has its new plant near Springfield, Ill., in operation. Equipment at the plant includes facilities for polymerizing vinyl acrylic, methacrylic, styrene, acrylonitrile, allyl and similar compounds. —*End*

READERS' VIEWS AND COMMENTS

Price Reduction

To the Editor:

Sir:—A little less than a year ago I renewed my subscription to *Chemical Engineering* for three years enclosing $9 in payment. Several months ago the subscription rate was reduced to the old rate of three years for $5, as you know. I believe that it is only fair for you to extend my subscription for at least two extra years, since my advance payment still represents $6 or more.

H. N. Tatomer

Niagara Falls, N. Y.

NOTE: *Reader Tatomer had no cause to worry. Chemical Engineering's subscription records and stencils have been changed to extend all subscriptions affected by the change in rate.*—EDITOR.

Thrust . . .

To the Editor:

Sir: In the August issue of Chemical Engineering there appeared an article entitled "Polytropic Compression in Centrifugal Compressors" by Igor J. Karassik. Since the writer objects to several inconsistencies in context, some comment is indicated.

Primarily, my criticism arises from the fact that Mr. Karassik has violated the basic definition of reversible or non-reversible processes. Thus, an adiabatic compression in which the law pv^n is obeyed must of necessity be a reversible adiabatic compression. It is much easier to think of a polytropic compression, as one in which the exponent n has been chosen to fit particular circumstances. While the medium of a letter does not permit full discussion of basic theory and practice, there does not appear to be any reason

(*Continued*)

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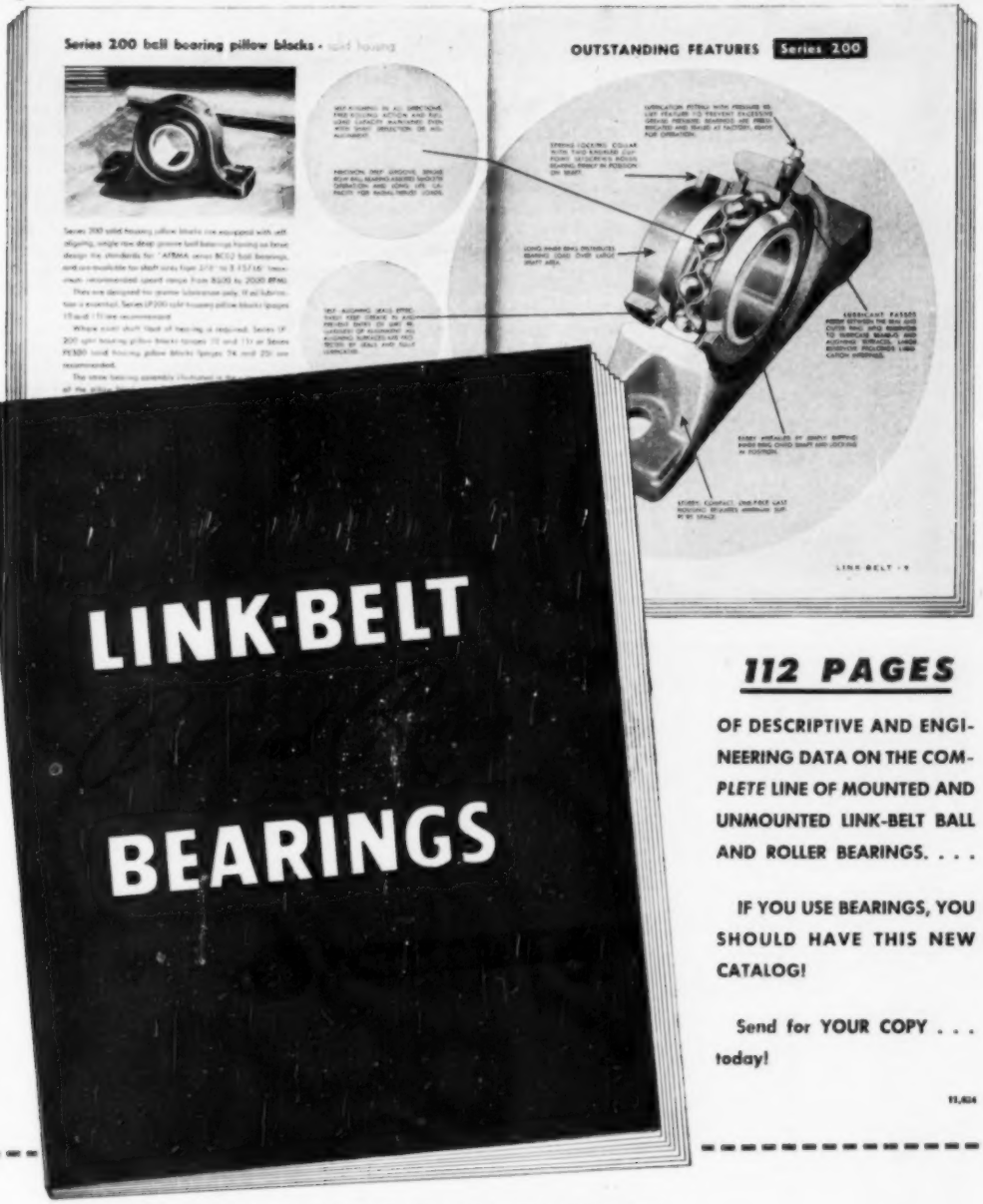

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a polytropic efficiency, as defined by the author, cannot exceed 100 percent. In any irreversible compression, if heat is lost at a greater rate than that corresponding to the degradation of kinetic energy into heat by compression inefficiencies, n will be less than k and e_p will exceed 100 percent.

The analogy to a pump, turbine, brake combination do not appear well warranted, and, in fact tends to cloud the basic phenomena of compressor performance.

Another point which the author neglects to state is the applicability of perfect gas laws to his expressions. In general, while the approach selected by Mr. Karassik may be of some value to one skilled in the art, it does not help much in understanding the actual underlying theory, nor does it aid in the interpretation of actual data. From the point of view of accurate representation or clarification of centrifugal compression design, there is a basic objection to this explanation.

D. S. MAISEL

Esso Laboratories
Linden, N. J.

. . . Parry

To the Editor:

Sir:—I wish to thank you for sending me Mr. Maisel's comments. I appreciate the opportunity to answer his letter.

The article in question had, of necessity, to deal with two separate problems: it presented a definition of polytropic compression in general and followed this with a definition of polytropic compression in centrifugal compressors. Both processes were presented on the figure illustrating the pressure-volume diagram for polytropic compressions. However, the reader was immediately warned that the actual compression in an uncooled centrifugal compressor was polytropic with an n value greater than k. Thus, Mr. Maisel's statement that a polytropic efficiency as defined by the author could exceed 100 percent neglects to take into account that the analysis which followed referred *strictly* to uncooled *centrifugal* compressors and not to a compression process of undeterminate character. The article specifically states that "—— Equation (1) was derived strictly on the assumption that no energy is added or removed beyond the work applied to the compressor at the shaft." Thus, Mr. Maisel's statement that "if heat is lost at a greater rate than that corresponding to the degradation of kinetic energy into heat by compression inefficiencies, n will be

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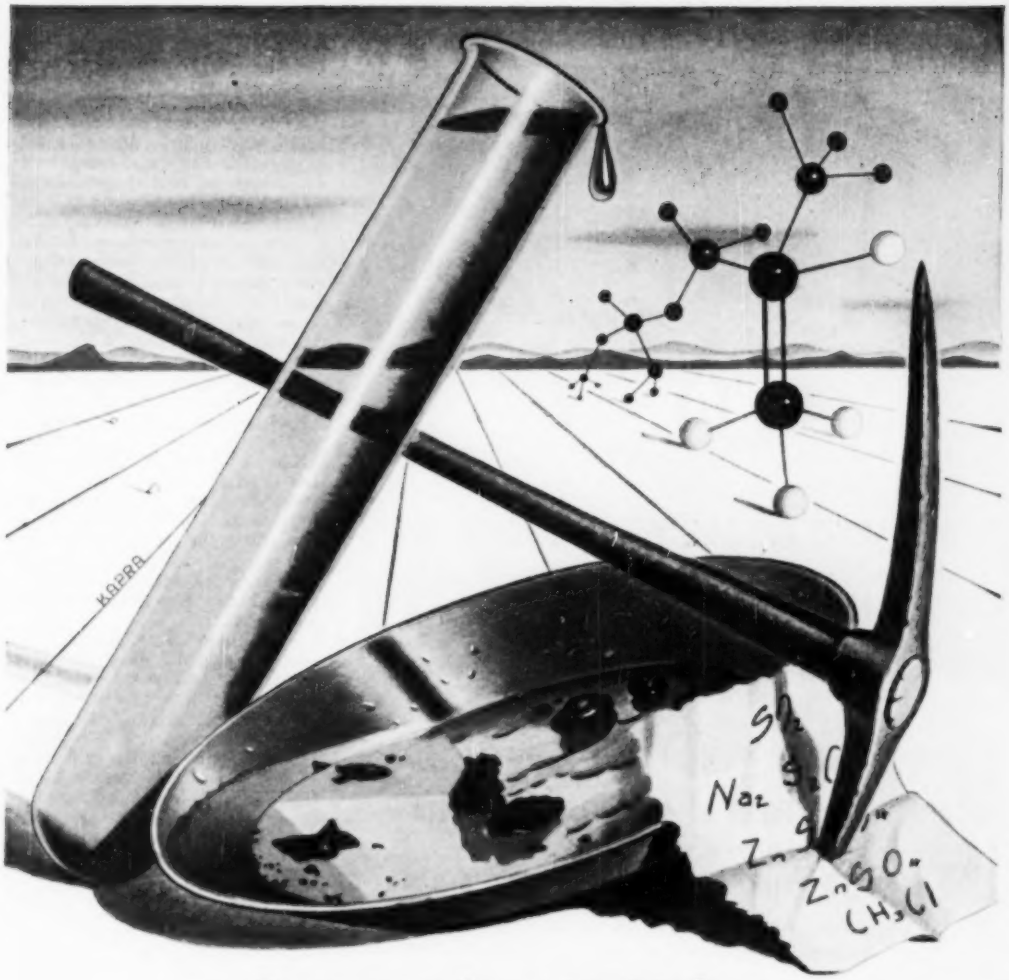

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less than *k* and *e*, will exceed 100 percent" is exactly the type of misunderstanding the article attempted to dispel. The author therefore wishes again to emphasize that the entire treatment of the problem in his article referred to uncooled centrifugal compressors where both the heat of compression and that due to compresor inefficiency remain within the gas handled.

As to the analogy between compression processes and the pump, turbine and brake combination, the author admits that it has the characteristics of all analogies: that is when pushed too far, they break down. Nevertheless, this analogy was the nearest form of explanation which could be made reasonably clear to those who—as Mr. Maisel terms it—may not be skilled in the art. Referring again to the article, Case I is the only one comparable to an uncooled centrifugal compressor while the remaining three cases all represent some form of abstracting heat during the compression process and therefore violate the important assumption that no energy is added or removed other than the work applied at the shaft.

All of the discussion in the article referred to by Mr. Maisel was based on the same assumption as the discussion in the five articles which this later article amplified (see "Process Engineer's Guide to the Centrifugal Compressor," *Chem. Eng.* Oct., Nov., Dec. 1947; Jan., Feb., 1948) and that is that all relations apply only in-so-far as gases follow the perfect gas laws. A complete presentation of the effects of compressibility on the relations in question would have required a much more extensive treatment than could be presented in these articles. Of interest in connection with this phase of the problem, reference can be made to the "Worthington Research Bulletin P-7637," July 1949.

IGOR J. KARASSIK
Worthington Pump and Machinery Corp.
Harrison, N. J.

—End

Indexes

Continuing the practice started by *Chem. & Met.* several years ago, printed below are indexes for Reports and Pictured Flowsheets published to date.

An Index to *Chemical Engineering* Reports, 1926-1949

Air Separation — Mar. 1947
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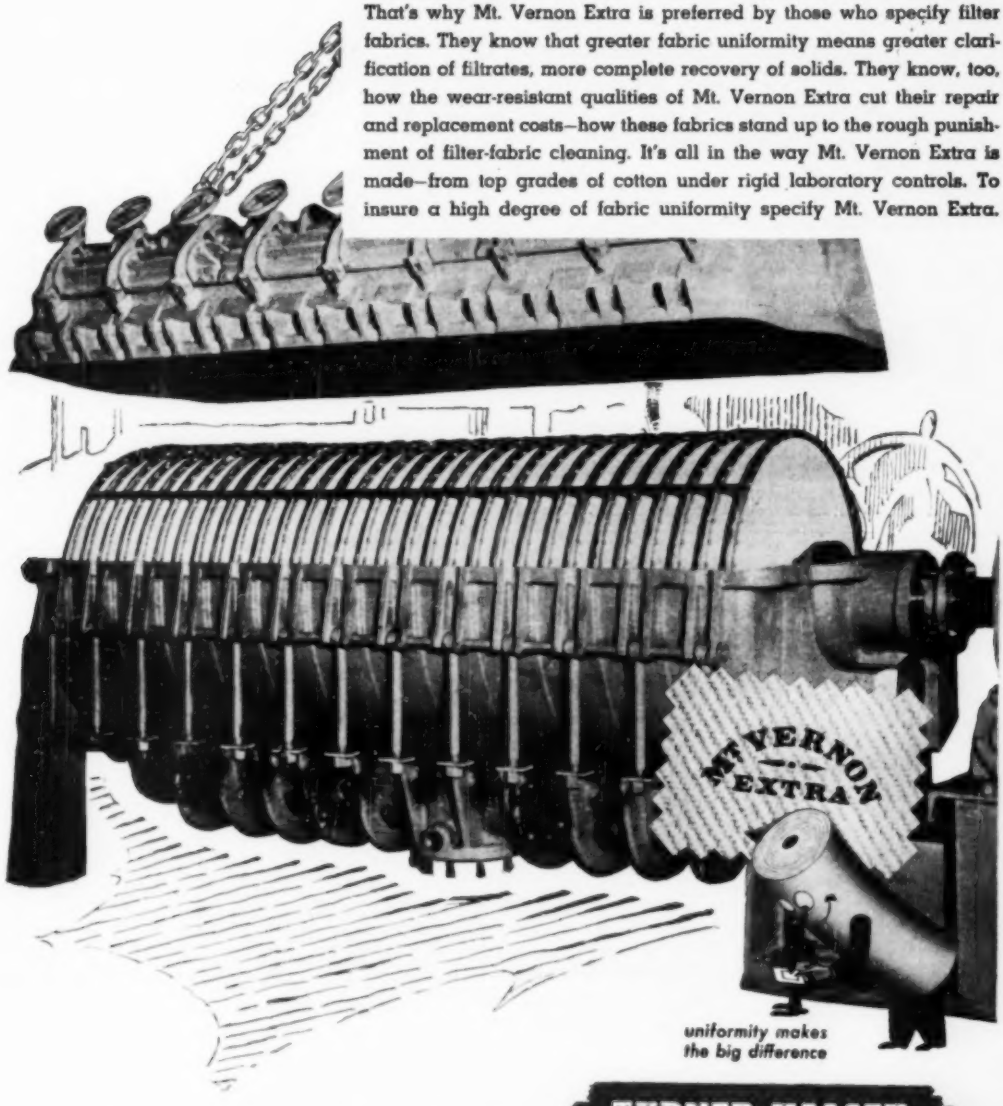

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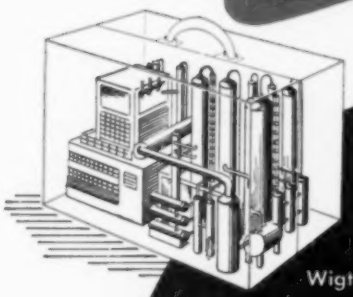

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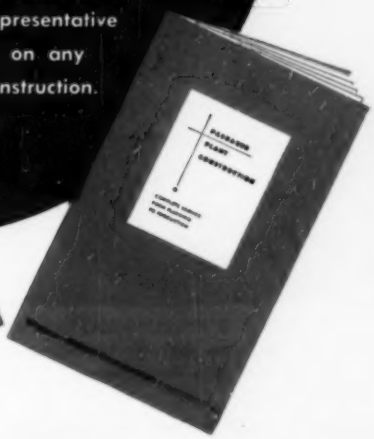

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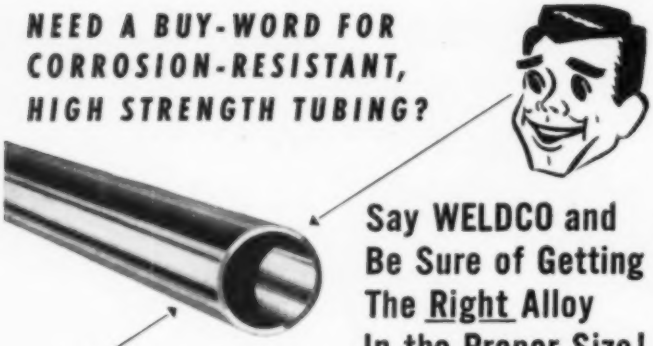

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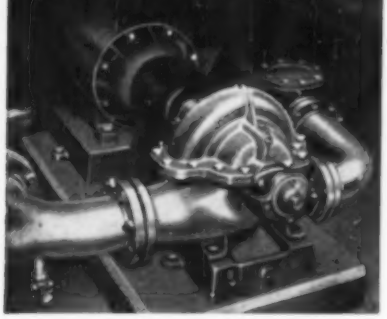

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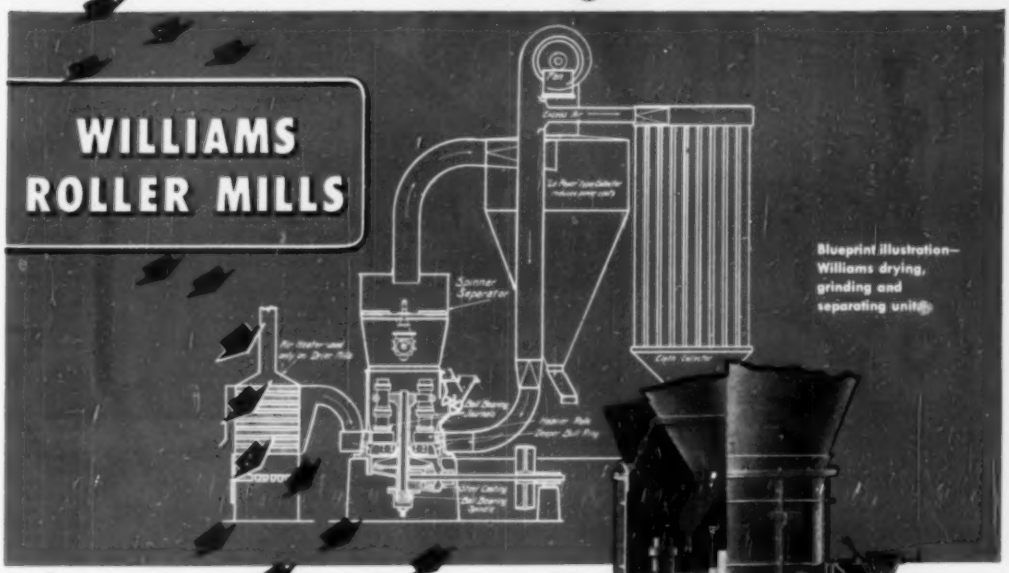

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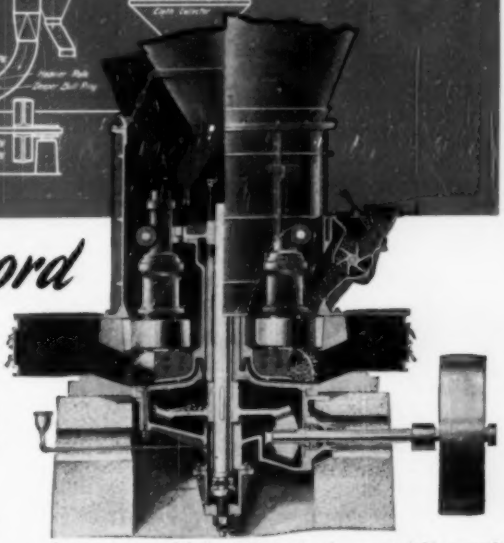

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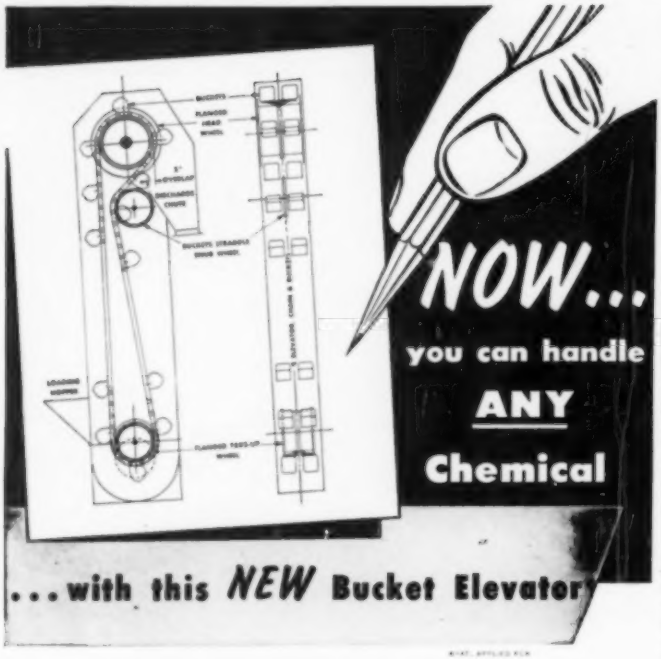

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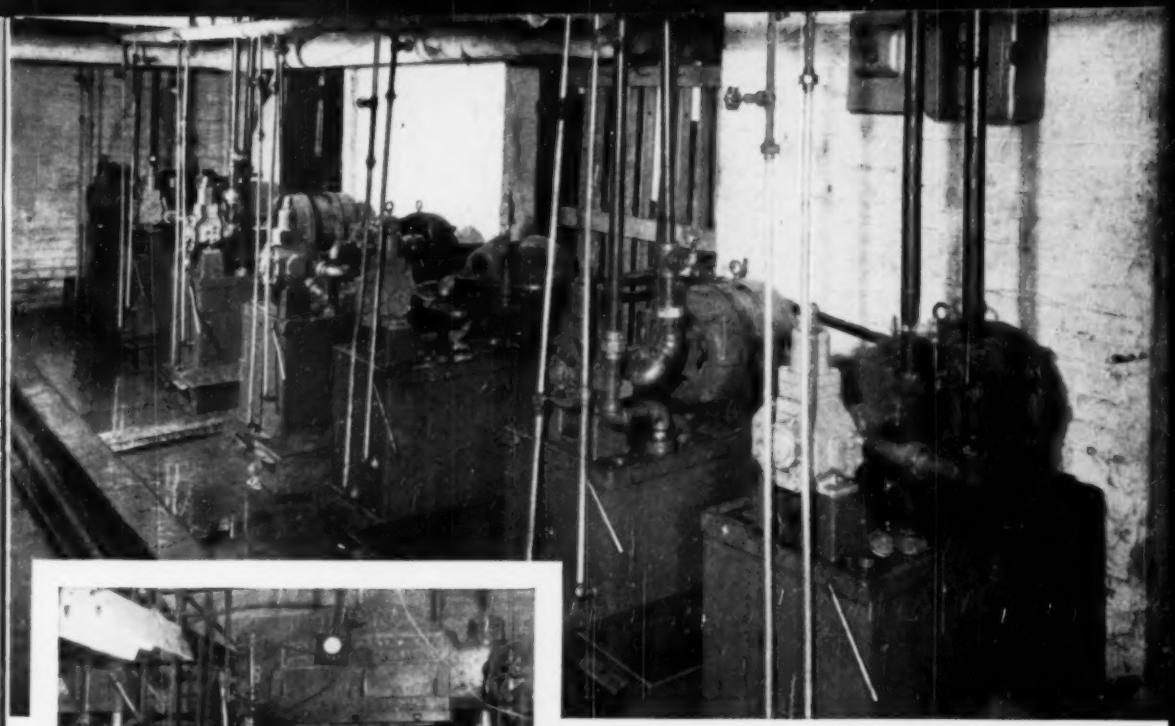
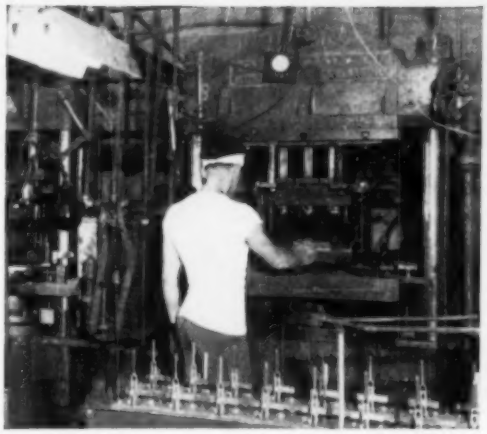
Sulphuric Acid (sludge)	May 1941
Synthetic Ammonia	Dec. 1945
Synthetic Bead Catalyst	Apr. 1946
Synthetic Zeolite	Sept. 1949
Tantalum	Sept. 1948
Terpene Oils (and rosin)	Dec. 1947
Varnish and Paint	Mar. 1945
Vegetable Oil	May 1947
Whiskey	Nov. 1942
White Lead	Mar. 1943
Zinc Oxide	Feb. 1941





Stanoil 95 Industrial Oil

Are your hydraulic operations as free of trouble as this?

THE HYDRAULIC UNITS shown above are used for the operation of plastic-moulding presses in a midwest plant. Hydraulic oil pressures reach 2500 psi. Oil temperatures average between 120° and 130° F. Presses, operating on a three-shift basis, require 24-hour operation of the hydraulic units.

Stanoil 95 has been used as the hydraulic medium in these units for well over a year. During this period of hard, continuous service, the hydraulic oil systems have required no cleaning. No oil changes have been necessary. Hydraulic controls have functioned smoothly.

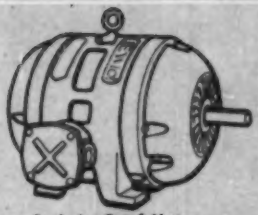
How does this hydraulic oil performance compare with that in your plant? If you are experiencing trouble with oil deposits, oil deterioration, or oil foaming, you can benefit by changing to Stanoil. This multi-purpose industrial oil contains an oxidation inhibitor and an anti-foam additive that contribute to long oil life and clean, reliable operation of hydraulic units, speed reducers, and circulating systems.

If your plant is located in the Midwest, write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, to secure the services of the Standard Oil Lubrication Engineer nearest you.

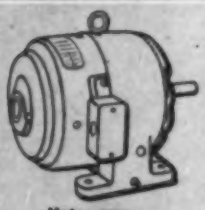
STANDARD OIL COMPANY (INDIANA) STANDARD

Vertical Motors

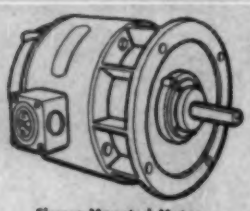
General-Purpose Ball-Bearing Motors



Explosion-Proof Motors



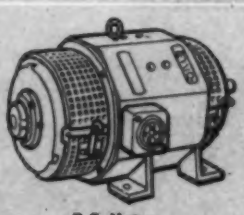
Motorgears



Flange-Mounted Motors

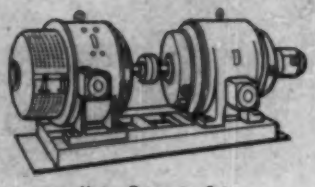
Totally Enclosed Fan Cooled

when it comes to Motors...



D.C. Motors

You stand to gain much in dealing with your Fairbanks-Morse Branch or Dealer as the single source for *all* your electric motor requirements. Not the least are the benefits of undivided responsibility, unprejudiced advice and application assistance. For your copy of the handy "Pocket Panorama" which illustrates the complete line . . . write Fairbanks, Morse & Co., Chicago 5, Illinois.



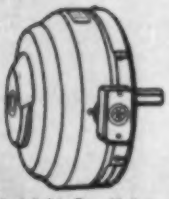
Motor Generator Sets

FAIRBANKS-MORSE

A name worth remembering

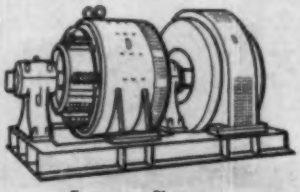
DIESEL LOCOMOTIVES • DIESEL ENGINES • PUMPS • SCALES • MOTORS • GENERATORS
STOKERS • RAILROAD MOTOR CARS and STANDPIPES • FARM EQUIPMENT • MAGNETOS

High-Speed A.C. Generators



Axial Air Gap Motors

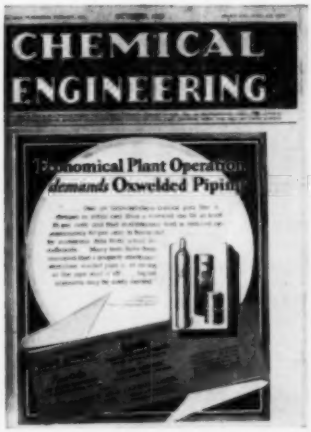
Low-Speed A.C. Generators



Frequency Changer

Men, Machines and Methods

ROGER WILLIAMS, Jr., Associate Editor



TWENTY YEARS AGO this magazine's cover looked different, but not so the editorial aim. Publisher Williamson (l.) and Editor Kirkpatrick (r.) were at the helm. Williamson has just relinquished that job, added a few grey hairs, remains closely connected with us. Kirkpatrick, Editor then and now, has taken added responsibilities, changed little in looks.

The Clouded Crystal Ball—or, When the Crash Came

When newspapers and magazines reprinted pictures, a couple of months ago, about the twentieth anniversary of the stock market crash, we started thinking about the chemical industry at that time. So, we dug out the October 1929 issue of *Chem. & Met.* and took a look.

That look convinced us of one thing: the chemical process industries have come a long way in those twenty years.

ADVERTISING

Some of the things in that October 1929 issue sound odd today. Here are some gems from the advertisements:

The F. J. Stokes Machine Co. advertised: "Soon You'll Buy by Television. In ten years, perhaps sooner, you'll put in a 'television call'—see the equipment in which you are interested—pass on its points of superiority—have the features explained—make your decision—all with speed and certainty."

In 1929, stainless steel was something new and high priced. So the American Stainless Steel Co. urged: "It is a good plan to keep several bars of 'Stainless' in your own machine shop. You will find hundreds of equipment items in which it can be used advantageously." Plastics were so little thought of as chemical equipment materials that there wasn't a single such ad.

Another company advertised "A New Servant of Industry . . . . today this important basic chemical is being shipped in tank cars at a price which promises *new* and *revolutionary* uses." That was Du Pont advertising anhydrous ammonia.

And the Philadelphia Gear Works proudly announced: "Off to Berlin! Via Graff Zeppelin we shipped one of our Philadelphia Speed Reducing Units."

EDITORIAL CONTENT

Well, if some of the advertising copy writers were dreaming of television telephones, so was one editor. Here was the future as the magazine saw it then: "There is so far no evidence, either in the statistical barometers or trade sentiment, of any general or unnatural slump in business. What is happening is apparently only a gradual readjustment of the automobile-building-steel group of industries back to a more normal level of activity following a long period of unseasonable or excessive expansion."

Stock prices were carried by *Chem. & Met.* in those days, and the October issue carried the September 30 prices. Allied Chemical was 315, Firestone Tire 227, Eastman Kodak 221, U. S. Industrial Alcohol 210, Air Reduction 204, Du Pont 188¼. By the November issue, just a month later, Allied was 251, Firestone 210, Eastman 208¼, USI 151¼, Air Reduction 142 and Du Pont 140. (Just two years later, *Chem. & Met.* stopped carrying stock market prices. Apparently, readers had lost interest in the stock market.)

Lots of things other than the stock market were moving, back in October 1929. The new construction section proudly announced Shell Development was planning a $5,000,000 "nitrogen filtration [sic] plant." Herbert Dow was announced as the 1930 Perkin Medal winner, and James A. Rafferty was elected president of Carbide and Carbon. Elmer Bolton was named assistant director of the "central chem-

(Continued)

OLDBURY

ELECTRO-CHEMICAL COMPANY

PHOSPHORUS (Yellow or White)	PHOSPHORIC ANHYDRIDE
PHOSPHORUS OXYCHLORIDE	PHOSPHORIC ACID
PHOSPHORUS TRICHLORIDE	SODIUM CHLORATE
PHOSPHORUS PENTACHLORIDE	POTASSIUM CHLORATE
PHOSPHORUS PENTASULFIDE	POTASSIUM PERCHLORATE
PHOSPHORUS SESQUISULPHIDE	HYPOPHOSPHITES
AMORPHOUS PHOSPHORUS	OXALIC ACID (Powdered or Crystal)

ZINC PHOSPHIDE

Plant and Main Office:
NIAGARA FALLS, NEW YORK

New York Office:
19 RECTOR ST., NEW YORK 6, N.Y.

STAMANCO

HI-PRESSURE TANKS

Made in both horizontal and vertical types for storing all types of gases under pressure, STAMANCO Hi-Pressure Tanks are soundly engineered and ruggedly built to give long dependable service. All-welded or riveted construction. We would appreciate the opportunity of discussing your gas storage problems with you.

The STACEY MANUFACTURING Co.
SINCE 1851
CINCINNATI 16, OHIO

GAS HOLDERS • HI-PRESSURE TANKS • PURIFIER BOXES

ENGINEERS • FABRICATORS • CONSTRUCTORS

An Independent Organization Not Affiliated With Any Other Builders of Gas Holders

ical organization" of Du Pont. Hugh K. Moore, a past president of AIChE, announced he would run for governor of New Hampshire. (*Chem. & Met.* never recorded the election result. He didn't win.)

The news from Washington was all on tariffs. *Chem. & Met.*'s Paul Wooton expected a "violent attack upon retention of American selling price as a basis for the assessment of duties upon coal-tar products."

Chem. & Met. editorialized, "When two such splendid representatives of the great English-speaking nations as J. Ramsay MacDonald and Herbert Hoover can sit down on a log in a Virginia mountain camp and within a few hours dispose of major issues affecting the human welfare of hundreds of millions, it must be obvious that we have made a great deal of progress in international relations."

The AIChE was wrangling over whether or not it should have a full-time, paid executive secretary. Steve Tyler might not like to be reminded that *Chem. & Met.* then said, "Changes in publishing policy, the extension of its membership, and perhaps the establishment of research or other pertinent activities are all problems that can be easily solved once they become the concern of some strongly centralized agency."

PERSONNEL

In personnel, the magazine has shown some great changes since 1929. But of the seven men listed on the 1929 masthead, only one is no longer connected with *Chemical Engineering* in some way. That person is Paul D. V. Manning, then an assistant editor located in San Francisco and now vice president of International Mineral & Chemical. Sid Kirkpatrick was and is editor. Jim Lee, Ted Olive, Henry Batters, Russ McBride are all still serving the magazine editorially. Mage Williamson, publisher then, has just relinquished that job, but in his new job in McGraw-Hill will be tied closely to the magazine.

SIZE CHANGES

The magazine itself has changed in size, but not too much. The October 1929 issue had 228 pages (64 editorial matter and 164 advertising) and the 1949 issue had 380 pages (103 editorial, 277 advertising). Perhaps the most striking difference in the ads is the generous use of color today. In 1929 almost all the ads were just black and white. For those interested in useless statistics, the 1929 issue had 18 ads using color, the 1949 issue 108 ads. In 1929, 278 advertisers used 164

(*Continued*)

Bagpakers

designed and serviced by the manufacturer of BAGPAK Multiwall Bags

Who but a manufacturer of multiwall paper bags is best equipped to design and service bag packaging machinery?

Automatic advantages of faster, more efficient packaging come with automatic BAGPAKERS . . . that's why we say —

if you want — a packaging machine that sews a multiwall tighter and faster — rely on a BAGPAKER . . .

if you want — an automatic machine that weighs, fills, settles and seals better — rely on BAGPAKER . . .

if you want — a real performer — a dependable machine that boosts and maintains production rates — rely on BAGPAKER.

BAGPAKERS and Bagpak Multiwall Bags are ideal for packing food, chemicals and fertilizers. Write for our booklet 200B—it will give you added information on these money- and labor-saving machines and multiwall bags.

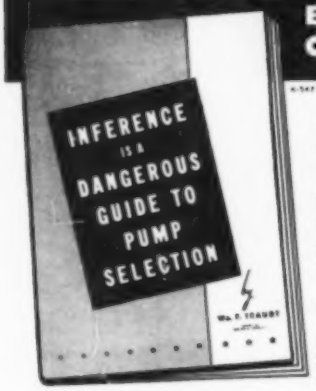
BAGPAK DIVISION

INTERNATIONAL PAPER COMPANY, Bagpak Division
220 East 42nd St., New York 17, N. Y.

BRANCH OFFICES: Atlanta, Baltimore, Boston, Chicago, Cleveland, Baxter Springs, Kansas, Los Angeles, New Orleans, Philadelphia, Pittsburgh, St. Louis, San Francisco.

In Canada: Continental Paper Products, Ltd., Montreal, Ottawa.

LEARN THE **BASIC FACTS** BEFORE DECIDING ON TYPE OF PUMP



Fault-filled enthusiasms for certain types of pumps now running rampant in industry, are dangerous. Because a type of pump performs sensationally on somebody else's job, it isn't necessarily certified to your use.

The unbiased, basic facts concerning types of pumps are contained in our special bulletin S-146. Big illustrations and briefed descriptions deal with the capacities and adaptability of such types as piston, plunger, rotary and centrifugal pumps.

We'll gladly send a copy free, if you will request it on your company letterhead.

TABER PUMP CO. • Est. 1859 • 294 ELM ST., BUFFALO 3, N. Y.

TABER Higher Practical Performance **PUMPS**

Fletcher

HIGH SPEED CENTRIFUGALS

. . . speed up the separation, filtering and dehydration of chemicals. Daily output is increased because FLETCHER "*High-Speed*" Centrifugals employ the exclusive "Centroid" Speed Control that automatically reduces the unloading speed to a safe 50 RPM. . . . Fletcher Engineers will recommend a single or group arrangement to help solve your processing problems.

MOTOR DRIVEN SUSPENDED AND OPEN TOP

See us at Booth 33—Chemical Show—
Nov. 28—Dec. 3—New York City, N. Y.

FLETCHER CENTRIFUGALS

FLETCHER WORKS, 235 GLENWOOD AVE., PHILADELPHIA 40. PA.

M M & M, *cont. . .*

pages, or an average of 1.24 pages per ad. Of the advertisers in October 1929, 197 did not advertise in the 1949 October issue, and 81 did. The 1949 issue listed 225 companies that did not advertise in the October 1929 magazine.

If there have been changes during the 20 years, the purpose of the magazine hasn't. On the cover in 1929 was the statement that *Chem. & Met.* was: "For the Production Man in the Chemical Engineering or Process Industries interested in heavy, fine and electro-chemicals, cement, lime, ceramics, cellulose, coal products, explosives, fertilizers, glass, leather, paint, varnish, oils, pulp, paper, petroleum, rubber, soap, sugar and similar products."

USDL Reports Wages In Chemical Plants

The Department of Labor recently released a survey of wages in the chemical industry. Although they are based on April 1949 figures, the results are still of interest. Here they are, briefly. For full details, get USDL, Bureau of Labor Statistics Wage Structure Bulletin No. 73, "Chemicals 1949," Washington 25, D. C.

Average, straight-time wage in the industry was $1.51 an hour. Most of the rates fell between $1.40 and $1.80. Less than five percent made less than $1, while 15 percent made more than $1.80.

By product grouping, the lowest average wage ($1.14) was in the manufacture of cleaning and polishing preparations; the maximum ($1.67) was in production of miscellaneous industrial organic chemicals. Those below average included: insecticides and fungicides, sulphonated oils and assistants, other miscellaneous chemicals and chemical products, compressed and liquefied gases, plastic materials and elastomers, and intermediates, dyes, color lakes and toners. Above average, beside the organic products mentioned, were industrial inorganic chemicals, and bone black, carbon black and lamp black.

By area, the wages averaged as follows: Southwest, $1.62; Border States, $1.61; Pacific, $1.55; Great Lakes, $1.54; Middle West, $1.47; Middle Atlantic, $1.46; New England, $1.35; Mountain, $1.28; and Southeast, $1.20.

This USDL survey covered 794 out of 907 "establishments" considered under chemicals, or almost 88 percent. But it covered 109,675 workers out of a total of 119,121, or 92 percent of the workers involved. —*End*

TURBINE TIPS

no. 4

question: Why use turbines as standbys?

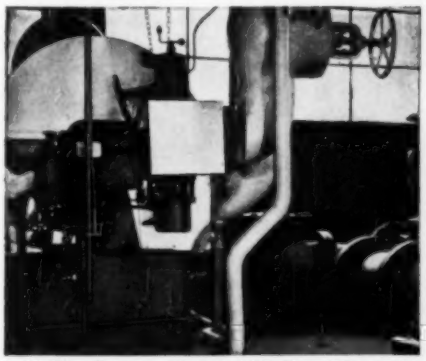
answer:

When an application study determines that vital pieces of equipment be driven by motors it is frequently a good idea to drive standbys with turbines, since they are extremely reliable, and their operation depends only on the steam supply. This may apply to equipment such as boiler auxiliaries, fire pumps, exciter sets, or house generators. If power fails, turbines with automatic quick-starting control or dual-drive arrangement can take over with hardly a change in the speed of the driven equipment.

question: What features make a turbine extra-reliable?

answer:

Standard construction features of the General Electric DP turbine provide extra dependability at no extra cost to the user. The governing system, totally enclosed in an oil atmosphere, is ready for immediate service even after long standby periods. All valve parts, nozzles, buckets, and packing fits are made of corrosion-resistant material—particularly important during periods of idleness when excessive moisture may be present. Pressure oil feed, previously obtainable only in "special" models, assures positive lubrication under all operating conditions. Reliable over-speed protection is provided by a totally-enclosed emergency governor.



In this West Coast sawmill, dependable General Electric DP Turbines are used to drive standby fire pumps.

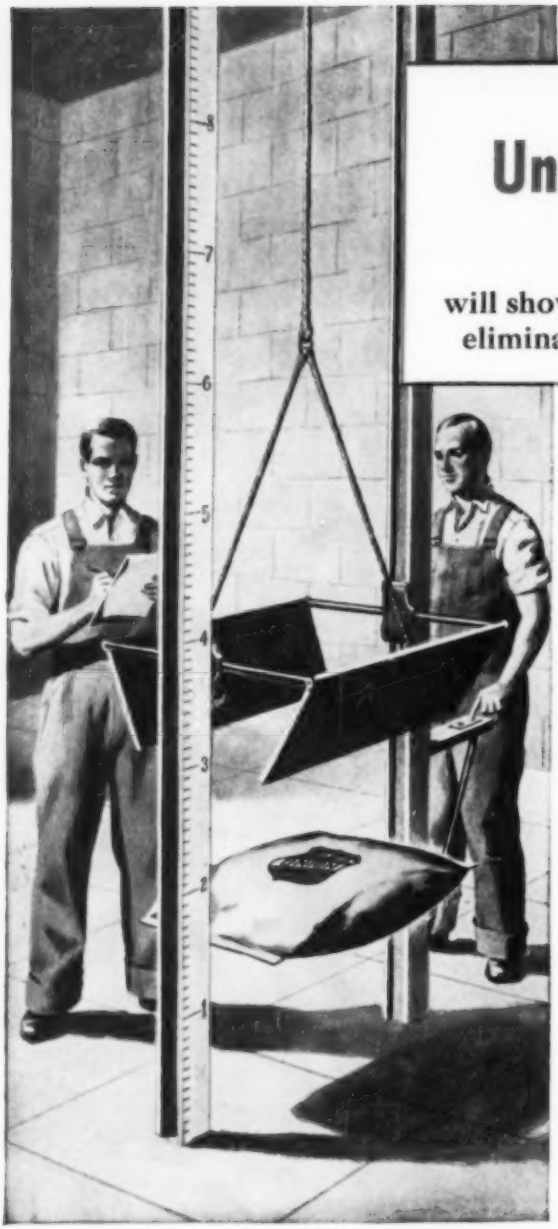
question: Where can I "get the facts" when considering a turbine application?

answer:

Just call or write the nearest G-E Apparatus Sales Office. Your G-E Sales Engineer will gladly give you complete data on the application of turbines to your mechanical-drives—regardless of location. Apparatus Department, General Electric Company, Schenectady 5, N. Y.

GENERAL ELECTRIC

252-41



Your

Union Multiwall Specialist

will show you how quality control eliminates customer complaints!

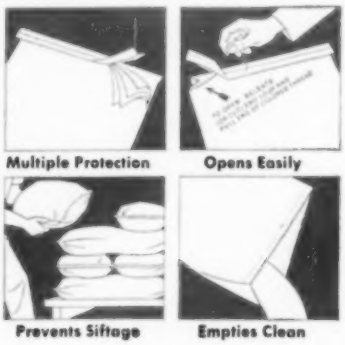
SHIPPERS of more than 300 different products find Union Multiwall Bags reduce customer complaints and losses in shipping and handling. They are custom-designed with reserve strength for hard knocks.

Continuous testing in Union laboratories leaves nothing to chance. Bag paper is tortured and torn, burst and frayed. Loaded bags are dropped and tumbled and scuffed to discover any weak points, any need for strengthening.

Union Quality Control checks and rechecks every step in the making from timber to finished bag.

This constant checking and testing is a safeguard for every order of Union Multiwall Bags. So when your Union Multiwall representative calls on you, tell him the requirements of your product, its shipping and handling. You can be sure your delivered bags will live up to specifications.

Even if you are now using multiwall bags, your Union representative can give you new ideas on bag construction, packaging and handling that will save you money. So welcome him when he calls!



Multiple Protection — Opens Easily

Prevents Siftage — Empties Clean

TRADE MARK UNION

UNION Multiwall Bags

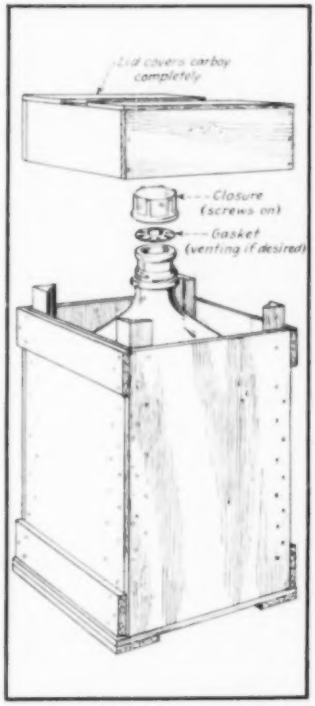
UNION BAG & PAPER CORPORATION

233 BROADWAY, NEW YORK 7, NEW YORK

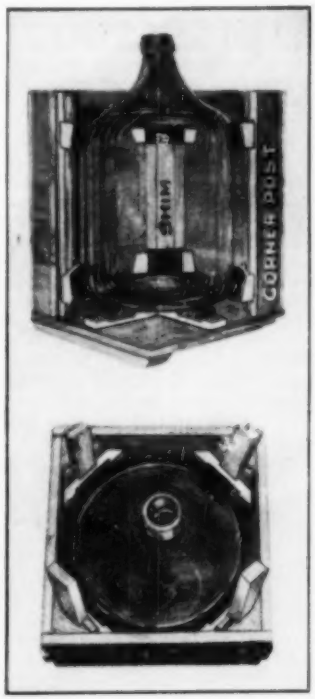
Offices in: CHICAGO, ILL. · NEW ORLEANS, LA. · MINNEAPOLIS, MINN. · KANSAS CITY, MO. · HOUSTON, TEXAS

Handling, Packaging and Shipping

R. W. LAHEY, Editorial Consultant



6½-GAL. CARBOY is catching on. Two popular features are closure and lid.



RUBBER CUSHIONING superior to older cork; doesn't disintegrate.

Packaging Notebook—I

CARBOYS

Standardization and better boxes make them safer

Carboys have been used to transport corrosive liquids for so many years that the chemical industry has come to take them for granted. The fact should not be overlooked that acid producers would find it difficult to distribute their products in small quantities both economically and safely without these containers.

There are no chemical containers that are subjected to greater abuse. Due to the nature of the materials that they carry, they are often stored in the open, exposed to corrosive vapors, extreme heat and cold, snow, rain and ice and rest in mud and water. The present day carboy is well able to withstand this treatment. It is the result of many improvements and developments which have been contributed by a substantial number of individuals extending over the last century. The obvious disadvantages of this package, such as high tare weight, care required in handling, and difficulty in stacking and tiering, have for years been the incentive for its replacement. But to date, no substitute has been found. To meet special conditions, rubber, stainless steel, and aluminum drums have been used, but they have not as yet become sufficiently popular to be a threat to the future of the carboy.

The first carboys were extremely fragile and crude compared with those of today. The bottles were the balloon type which are still made and used in Europe. These bottles have little strength, the glass is poorly distributed and there are large variations in their capacities and shapes. This is due to the fact that the bottles are blown without the use of a mold other than a clay bottom pad. The first manufacturing improvement took place when a complete mold was used. This permitted a change in shape to the straight sided type. Other improvements have been made such as replacing old brick lehrs with automatic ones. Better methods of testing such as the use of polariscopes have also been adopted. An automatic glass blowing machine is in use for the 6½ gallon bottle but the 13 gallon size is still a hand operation.

CARBOY GENEOLOGY

In 1936 the Manufacturing Chemists Association in conjunction with Gaynor Glass Co. developed the Manufacturing Chemists Association 13-gal. bottle. This ware was adopted to replace the former 12 gal., 12½-gal. and 13-gal. bottles which had been in use. The specifications, as revised in 1943 require minimum weight of glass of 22 lb. and a specified side wall thickness of $\frac{7}{16}$ in., the minimum to be not less than $\frac{3}{8}$-in. thick. Thickness of glass in the bottom is set at ¼ in. with the same tolerance of $\frac{3}{16}$-in. minimum.

The Owens Illinois Glass Co. built an automatic machine for blowing 6½-gal. bottles and in 1947 with the cooperation of the Manufacturing Chemists Association a standard specification for the ware as well as a venting screw cap closure was adopted. This container has a nominal capacity of 6½-gal. (7-gal. to overflow), it weighs 14 lb. with a tolerance of minus ½ lb. and plus 1 lb. and the minimum thickness of glass is set at .075 in. It has a pour clean and outside screw thread finish and the plastic cap is equipped either with a venting or non-venting gasket. The venting liner is set to vent at 10 lb. pressure. The bottles are capable of withstanding a sustained internal pressure of 20 psig. and an instantaneous pressure of 40 psig.

The means used to protect the bot-

(Continued)

"Our best ads are installed . . ."

Continuous stave redwood pipe and fittings

COOLING TOWERS
WOOD TANKS
STAINLESS TANKS
WOOD PIPE
MULTI-FIN UNITS

since 1903

SANTA FE
TANK & TOWER CO.
ENGINEERS • FABRICATORS • ERECTORS
5401 S. Boyle Ave., Los Angeles 11
Branches: New York, Boston, Chicago, Tulsa, Houston, San Francisco

when the call is for
CONTROLS
you'll find the answer
HERE

Bigger, Better, General Controls Catalog now ready —reserve your copy!

104 pages covering the *complete* General Controls line of Automatic Pressure, Temperature, Level and Flow controls. It charts, tabulates and details, capacities, pressures, dimensions and specifications of hundreds of controls. Whatever the product or process—in heating, refrigeration, aircraft or industry, there's a *better* General Control for the job. General Controls *do* more and cost *less*. The new Catalog tells how and why. Send for your copy today.

GENERAL CONTROLS
822 Allen Ave., Glendale 1, Calif.

GENERAL CONTROLS
Automatic Pressure, Temperature, Level and Flow Controls
FACTORY BRANCHES: Baltimore (3), Birmingham (3), Boston (16), Buffalo (3), Chicago (5), Cincinnati (2), Cleveland (15), Dallas (3), Denver (4), Detroit (8), Glendale (1), Houston (6), Kansas City (2), New York (17), Minneapolis (2), Philadelphia (40), Pittsburgh (22), San Francisco (7), Seattle (1), St. Louis (12), Tulsa (4). DISTRIBUTORS IN PRINCIPAL CITIES

tles against shocks encountered in transportation and handling is as important a consideration as is the strength of the glass container. The wooden box, the cushioning material, and the method employed in suspending the bottle in the box all play an important part in providing this necessary protection. The cushions and the materials used for suspending the bottle, being concealed, must not be subject to deterioration or to injury from shock—otherwise serious accidents may result.

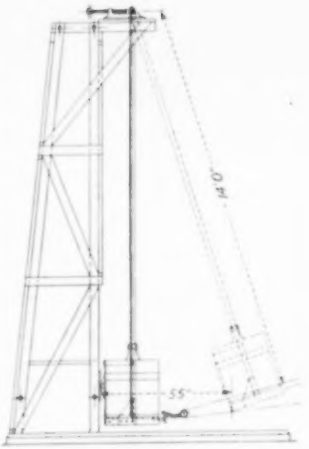
HOW TO CUSHION A CARBOY

At first, salt hay, ground cork, mineral wool and similar materials were used for cushioning. It is obvious that such cushions are not durable particularly when carboys are stored in the open. They were replaced by wooden spring strips and rockers. Then virgin cork blocks were adopted for cushioning, side pressure was usually obtained by shims or blocks between the corner posts of the box and the cushions. Protection was considerably increased by the adoption of these virgin cork cushions. Then came cushions molded of ground cork with asphalt as a binder, and shaped on the outside to fit in the box corners and on the inside to fit on the shoulders of the bottle. These blocks, eight to a box, provide effective cushions except in excessive cold.

The latest and best cushions are made of a special grade of reclaimed rubber. They are the only ones that do not deteriorate and they provide adequate cushioning under all ordinary atmospheric conditions.

Carboys are tested on the swing test apparatus which is prescribed by the Interstate Commerce Commission. This test is designed to duplicate the shock which a carboy undergoes when a freight car hits a bumper at a speed of 6 mph. This shock is simulated by a swing test of 55 in. with carboy bottles filled with water. To comply with the Interstate Commerce Commission Regulations for shipping dangerous liquids, 90 percent of the carboys must withstand this 55 in. swing test when striking both side and bottom of container.

When this apparatus was first devised it was difficult to find containers which could survive the shock from the 55-in. swing. Adoption of the virgin cork cushions improved bottle protection so carboys could withstand shocks from 60 to 75-in. swing tests. The molded cork blocks and the reclaimed rubber blocks provide even greater protection against shock. It is difficult to use swing test results for determination of safe and economical



SWING TEST is now ICC criterion. It simulates freight car hitting bumper.

carboy designs. It is obvious that carboys that will pass the more severe tests can stand greater transportation abuse but this is only one of the requirements. Other considerations include possibilities of deterioration of cushions, effect on cushioning of extremes of atmospheric temperature, ability to discover concealed damage to interior cushioning, and elimination of errors in assembly of carboys by simplicity of installation of interior packing.

HOW TO CHOOSE A CARBOY

Safety is the first consideration in choosing a carboy. Next in order of importance is the cost. As carboys are returnable containers purchase price of new carboys must be considered only to be a substantial part of the container cost. Constant repairs and replacement of worn parts during the life of the box and the cushions often can amount to more than the original cost, yet is usually so buried that its significance is not appreciated. As repairs and replacements of bottles, cushions, and boxes vary considerably for the different types in use, the only accurate cost comparison is the per trip cost. It is readily obtained by maintaining a detailed account of all costs and a record of the number of carboys shipped.

The 6½ gal. carboy has proved to be the most significant development in recent years. The importance of this new container is illustrated by its adoption for transportation of reagent grade acids. This bottle is much stronger than the 13-gal. ware, thus safety in transportation is considerably increased. Handling and storage

(*Continued*)

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- ☐ CHLORINATED TRISODIUM PHOSPHATE
- ☐ TRISODIUM PHOSPHATE, MONOHYDRATE
- ☐ DISODIUM PHOSPHATE, ANHYDROUS
- ☐ DISODIUM PHOSPHATE, CRYSTALLINE
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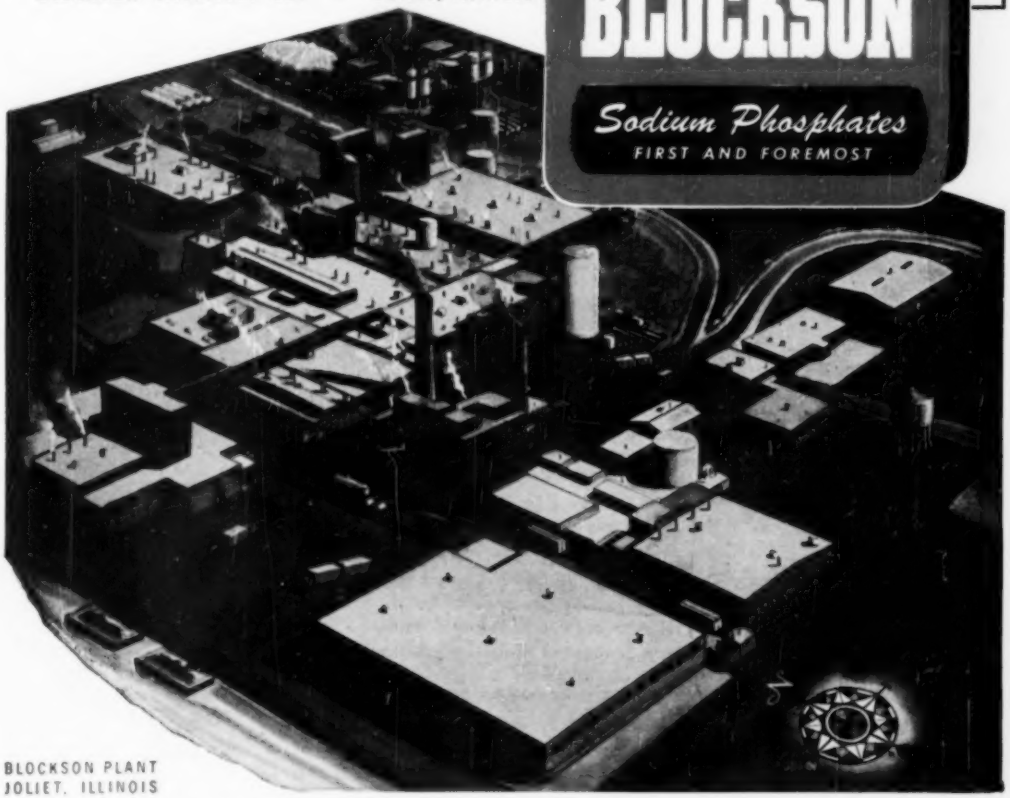

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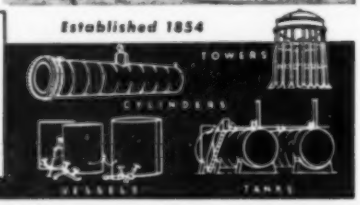

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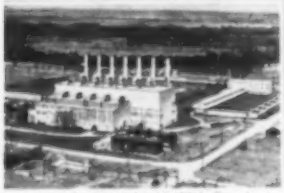

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are facilitated as shown by the fact that a carboy containing 66 deg. Be. sulphuric acid in the 13-gal. size weighs about 265 lb. and in the 6½-gal. size weighs about 135 lb. As the 6½ gal. container has the neck fully enclosed, it can be stacked either by hand or on pallets more efficiently. Comparative weights and space occupied are as follows:

	13-Gal.	6½-Gal.
Tare weight ...	68 lb.	26 lb.
Box dimensions:	*	
Height	24¾ in.	24⅛ in.
Width	19 in.	14⅝ in.
Depth	20½ in.	15⅝ in.

* Bottle neck extends 5-6 in. above top of cover.

A comparison of the two sizes shows that the first cost of the 13-gal. container is approximately 5 to 10 percent less than the cost of two 6½-gal. carboys. The much lower maintenance costs of the smaller carboy will more than make up this difference in a short time. The increased filling cost for the 6½-gal. carboy is offset by the cheaper closing of the outside screw cap, and the greater economy obtained in truck and freight-car loading.

The exceptional record of service of the carboy is known to all in the industry. If in years to come it maintains its place in the field of chemical containers it will be an additional tribute to those who have had a part in the development of this container.

Packaging for the Armed Services

The Navy Industrial Association's Packaging Advisory Committee has been actively advocating that all branches of the Military Establishment adopt uniform packaging requirements and that a standard manual be published for the guidance of industry. Sub-committees are investigating possibilities of improving existing packaging specifications of the Armed Services as well as changes in the interest of uniformity. Among the studies undertaken by other sub-committees are investigation of packaging materials for use in Arctic climates, vapor phase inhibitors, and standardization of can sizes for ordnance packing.

Rat Repellent Fiber Containers

According to C. A. Hampel, Armour Research Foundation, Chicago, corrugated and solid fiber shipping cases coated with sodium fluosilicate will protect foods from damage by rats. These cases are sealed with glue containing this compound. —*End*

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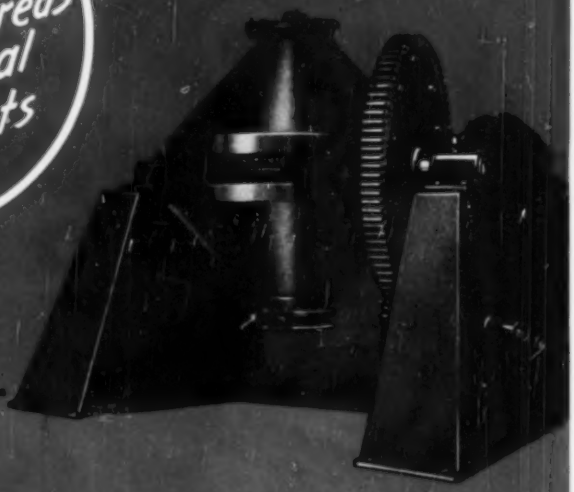

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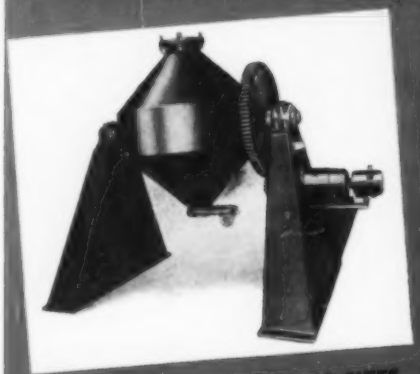

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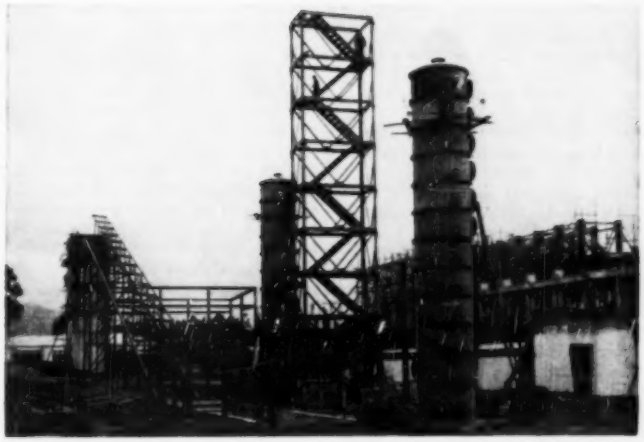

Imports will fall off when Colombia gets this large alkali plant operating next year. It will supply local industries. Soda ash, caustic and bicarbonate will be made here.

Large Alkali Plant Under Construction In Colombia Will Cut Our Exports

Bogota—A few miles from Bogota, the Colombian government is building a large alkali plant. It is situated at Betania, and draws on the extensive salt deposits of Zipaquira. The salt is carried as an enriched solution in a 4-mi. pipeline from the mines to the plant where it is purified. Coal and coke come from the mines of San Jorga, eight miles away and limestone has to be carried about 25 mi. As the plant lies on a railroad, and on an excellent highway, transportation problems are easily solved.

The plant was started in 1942 but construction had to be interrupted because of the war and was taken up again only in 1948. The plant will go into production at the end of 1950. It will produce 100 tons of soda ash per day. It will also produce 30 tons of caustic soda per day along with some bicarbonate. The rest, 55 tons of ash, will supply the seven glass and bottle factories in Bogata (2), Armenia, Cali, Manizales, Medellin and Pereira. At present Colombia imports 11,000 tons of caustic soda a year, 8,000 tons of soda ash and 2,500 tons of bicarbonate. Together with the saving of more than four million dollars on imported bottles and some more millions on plane glass, the new undertaking will bring a considerable saving of foreign exchange.

The plant is being built by engineers of the H. K. Ferguson Co., who are to install machinery and equipment and train Colombian personnel. Most of the machinery is being imported from the United States.

Dutch Viscose Producers Cut Their Price to U. S.

Amsterdam—Dutch viscose fiber producers (AKU) have been the first to reduce their prices on the American market after devaluation. It is reported that their product now undersells the American product. American Enka Corp. now offers Dutch viscose at 33-34 c. per lb. against 35-46 c. for the American fiber. The American market, the Dutch claim, can absorb large quantities of imported fiber without detriment to the American producer.

Overseas Gas Plans to Double Oxygen Output at Manila

Manila—Overseas Gas Corp. has announced an expansion program in line with the industrialization of the Philippines.

Their new $80,000 oxygen plant having a yearly capacity of 8,640,000 cu. ft. of oxygen gas is a new addition to their existing unit now in operation making an aggregate total of about 17,280,000 cu. ft. of oxygen gas produced annually.

The new unit, purchased from the Gas Equipment Engineering Corp. in Philadelphia, has just been installed at their Grace Park factory under the supervision of Raul J. Akot, the plant's chemical engineer and superintendent.

Increasing demand for this gas in oxy-acetylene welding and construction work for the rehabilitation of the damages caused by the last war has led L. V. Lagandaon, president of Overseas Gas, to put up one of the most modern plants in the Far East.

The firm was recently awarded a government contract to supply the requirements of the public work projects throughout the archipelago.

In the near future, the president said, they would also install complete machinery for the production of liquid and solid carbon dioxide which will serve the needs of various industrial applications.

American Sulphur May Lose Some Aussie Markets

Melbourne—Australia is expecting a shipment of 10,300 tons of ammonium sulphate from Russia. An order has also been placed with Britain for 16,400 tons. The Russian price is slightly higher, £31 per ton compared with £28/10 per ton for the English fertilizer.

Prime Minister Joseph B. Chifley has disclosed that the exchange pen-

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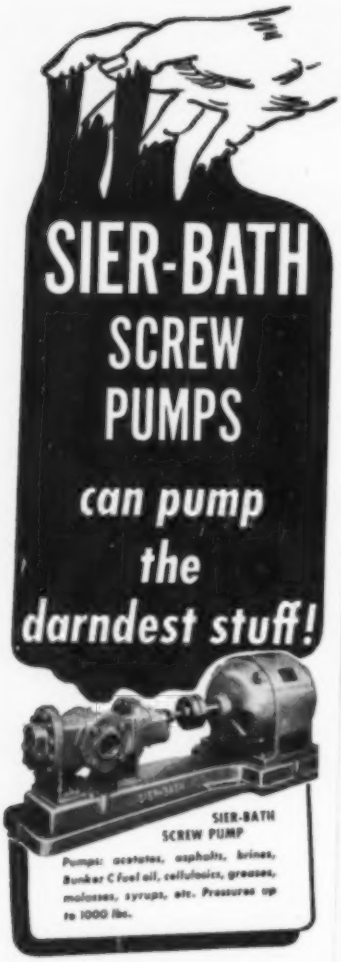

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ality of 44 percent on American sulphur, imposed by the devaluation of the Australian currency, has hastened plans to utilize Australia's own sulphur resources. He said that from the works of a single company 70,000 tons of sulphur are lost in fumes every year. He probably referred to one of the big sulphide ore treatment plants.

Efforts will also be made to obtain sulphur from England and other soft currency sources.

British Chemical Exports Growing But Producers Art Cutting Back Some Expansion Plans

London—A slight improvement in domestic sales, going beyond normal seasonal changes, has been noted by most chemical makers in England. Many of the export inquiries that came in immediately after the devaluation have meanwhile been translated into orders. Larger consignments of British chemicals have already been shipped to continental Europe, Latin America and the Canadian market, and a further increase in export demand is expected. Chemical exports in September rose to £6,990,000, from £6,590,000 in August, but for the first nine months of this year as a whole the export gain over 1948 has been insignificant.

The long-term outlook is viewed with rather mixed feelings. The government's new batch of economy measures will affect sales of some chemicals, especially for building and construction. The introduction of a fee for National Health Service prescriptions will probably reduce the demand for pharmaceuticals. Scaling-down the capital investment program will interfere with the more ambitious expansion projects in the chemical and petroleum industries even though construction work in progress now will not be curtailed. The cuts in the subsidies to agriculture may have indirect repercussions on the trade in fertilizers and insecticides.

As pre-devaluation stocks of imported raw materials are being depleted, prices are being advanced to meet the higher cost of fresh lots, but viewing the market as a whole it is the absence of wide-spread price corrections which calls for comment. The persistently easy tone of most sections of the British chemical market certainly confirms the view that supply and demand of most products are well balanced. Consumers have not rushed in to hedge against the risk of price advances later, and it seems that they have acted wisely. Export prices of a few scarce materials have risen, but on the whole it can be said that the price level of export chemicals shows little change in terms of sterling as compared with the situation a few months ago.

Nevertheless the devaluation has necessitated a revision of some trade agreements with foreign countries, and it is not always easy to adjust these to the changed conditions in a way that commends itself to both sides. The negotiations with the Argentine in particular, a very important market for British chemicals, have generated more heat than light. South Africa still insists on its import restrictions. And some of the European countries which followed Britain's devaluation lead complain that they are made to bear the cost of the currency move. Some time will undoubtedly elapse before these differences and difficulties are cleared up. Meanwhile there is little practical value in official statements in favor of multilateral trading and lowering of import barriers, especially between OEEC countries.

Machinery has been received for the big oil refinery under construction at Fawley, near Southampton, from the United States, and the Economic Cooperation Administration has sanctioned the purchase of machinery with Marshall plan funds for the petroleum chemicals plant being built for an Anglo-Iranian Oil-Distillers Co. subsidiary at Grangemouth, Scotland. The value of the machinery is stated to be $9,000,000. This is equivalent to three-fifths of the total estimated cost of this plant. In the light of the devaluation, however, this and other petroleum chemicals producers will have to revise their calculations. Petrochemicals Ltd., a company which is not allied to any of the big oil producing groups, had to increase its capital last year to meet increased costs partly caused by an upward revision of plant capacity and now announces that it needs still more money as the total expenditure on the project will reach £6,800,000. This compares with an estimate of £4,300,000 in August 1948.

The Petrochemicals plant is practically complete; four out of five furnaces are already in operation. It may be assumed that other interests in this field which started later on construction and purchase of equipment will at least not fare better. More serious even than the higher cost of plant and machinery at present prices is the fact that many of the products to be made by the British petroleum chemicals industry are now offered at greatly reduced prices by other suppliers. The

chairman of Petrochemicals Ltd. estimates the average fall in selling prices of the company's products at 30 percent, with the result that instead of a prospective profit of £1,400,000 after depreciation and research expenditure, an annual throughput of 75,000 tons is now expected to yield a profit of £600,000 at current price levels which may well be depressed further once competition between producers of petroleum chemicals begins in earnest.

EXPANSION CONTINUES

Although the changing market situation and the curtailment of capital investment has dampened enthusiasm for fresh manufacturing projects, work on extensions decided on earlier is proceeding on schedule. Pinchin Johnson and Associates, the leading paint makers, are acquiring fresh capital for further rehabilitation of their British factories and for extensions in overseas works. Work has started on the erection of a new solvent extraction process oil mill for a Lever subsidiary on Merseyside which will provide groundnut residual meal suitable for conversion into Ardil protein fiber. Imperial Chemical Industries Ltd. has received permission to proceed with the third stage of the development program for its Grangemouth plant. The Murgatroyd's Salt and Chemical Co. Ltd. will have its new chlorine and soda works in Cheshire in operation by early 1950. A new urea plant has been in production since June, and the supply of sulphuric acid has increased so much that statutory control over its production and distribution has been ended. The Steetley Co. has put in hand extensions to its works at Hartlepool, on the English North-East Coast, to increase the production of dead-burned magnesium oxide to the maximum possible on the present site. Powell Duffryn Carbon Products Ltd. has completed the extensions to its factory at Hayes, near London, and is now equipped with all the plant required for making carbon for electrical, chemical and metallurgical processes.

Among new products introduced lately to British consumers are several new fluor compounds. Imperial Smelting Corporation is making pilot-plant quantities of benzotrifluoride (suggested use: intermediate for dyestuffs and pharmaceuticals) and fluosulphic acid (for making aromatic sulphonyl fluorides, boron trifluoride and acid fluorides). Boron trifluoride is now available in commercial quantities. Three new penicillin preparations are being made by Glaxo Laboratories Ltd., and the supply of streptomycin from British plant has expanded sufficiently to allow general use on pre-

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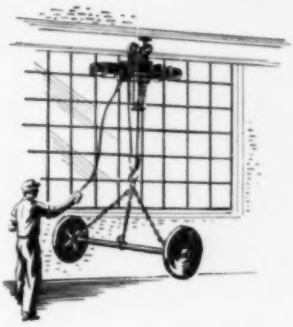
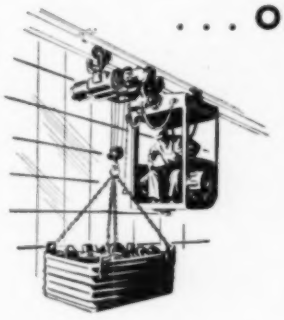
THEY LIFT THE SAME LOAD
BUT THEIR RUNNING COSTS DIFFER—



On the floor control, with the operator primarily occupied with other duties.

. . . OR



The operator in the cab, traveling loads at speeds up to 500 f.p.m. or more and occupying a better vantage point for spotting or stacking.

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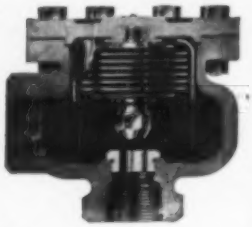

A leading food packer reports that a recent installation of Nicholson steam traps cut cooking time 30%. By keeping equipment full of live steam, they shortened one operation, for example, from 65 to 45 min. 5 types for every process, power, heat purpose; size ⅛" to 2"; press. to 225 lbs. For advanced features, BULLETIN 1047.

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scription. Trixylenyl phosphate is being made in commercial quantities by Coalite and Chemical Products Ltd. as a plasticizer. A new laminated material consisting of glass fabric bound with silicone resin has been put on the market by Bakelite Ltd. A new explosive, equivalent to Sheathed Permitted Explosives, is being marketed by Imperial Chemical Industries Ltd. under the brand name of "Unibel."

A complex silver thiosulphate has been developed by the PATRA research organization as a substitute for the highly poisonous silver argentocyanide in the Ballard process of copper-plating photogravure cylinders. Germanium is being extracted from Northumbrian and Durham coal flue dusts by a new process developed by General Electric Co., Ltd., which needs the element for use in modern crystal diodes and triodes. A synthetic thyroxine is being produced by Glaxo Laboratories Ltd.

Japan Raises Ammonium Sulphate Production

Tokio—No other major industry received such a crippling blow in the 1942-45 strategic bombing raids on Japan as ammonium sulphate production. While capacity losses in most industries ranged from 20 to 25 percent, production of this fertilizer was set back by 54.1 percent, from 1,659,000 tons a year to 762,000 tons. These figures relate to installations in the Japanese islands alone.

In the four years since the surrender the industry's capacity has been restored to 1,620,000 tons and actual production this year is likely to break through the 1,000,000-ton mark. The official target is 1,040,000 tons. These million-odd tons of fertilizer are cutting Japan's food imports by 350,000 tons, for each additional three tons of fertilizer are assumed to produce one extra ton of food. This is merely a rule-of-thumb calculation, based on the composite use of all principal fertilizers and manures and averaged for all principal food crops.

Faced with the alternative of feeding the Japanese indefinitely or of permitting them to restore an industry with a latent war potential, SCAP decided soon after the surrender to take a chance on a revived Japanese nitrogen-fixation capacity. Next to coal, the industry was scheduled for top priority in the allocation of reconstruction materials, electric power and rehabilitation funds. Superphosphate and calcium cyanamide, the other two major Japanese chemical fertilizers, qualified for similar advantages.

Until recently SCAP economic advisers had every reason to be satisfied with the progress made. Production was approaching prewar levels and capacity was running ahead to leave room for additional expansion. In view of the dire need for fertilizer, nobody paid much attention to the cost of producing it. The government bought all fertilizer on a cost-plus basis and sold it at a heavy loss to keep down the cost of food production. But what the consumers saved in lower food bills was taken out of their pockets in taxes to subsidize the fertilizer. SCAP economists identified this paradox as one of the root causes of the Japanese currency inflation. What made it a paradox was the fact that some ammonium sulphate producers were able to sell the fertilizer at half the cost claimed by others, and that the government lost only one-sixth as much on low-cost producers as on their less efficient competitors.

This was the situation when a SCAP directive ordered drastic slashes in government spending. The result was Japan's 1949-50 budget, the first in most people's memory to balance revenue and expenditure. The vote for the fertilizer subsidy had to be cut back to fit it into the budget.

Cost factors are partly bound up with the various processes used in ammonium sulphate production in Japan. For this reason the Japanese government has decided to divide producers into three groups and to subsidize members of each group uniformly according to the "technological" production cost calculated for each group. The purchase price per ton for members of Group A has been set at 17,200 yen, for Group B at 17,700 yen and for Group C at 19,500 yen (360 yen equals U.S. $1.) Under the former system the government paid from 14,000 yen to 28,000 yen, selling the fertilizer at 11,126 yen.

Group A comprises six plants which produce their hydrogen for synthesis either by electrolysis alone or in conjunction with hydrogen from water gas. Group B includes seven plants using the above combination of hydrogen sources, but operating under unfavorable cost conditions, or deriving their hydrogen from water gas alone, but under favorable cost conditions. Group C covers five plants which derive their hydrogen from water gas alone.

It will be noted that gas works and coke oven byproduct ammonium sulphate is not provided for. This is natural because it plays no important part in Japan's fertilizer economy. Also, ammonium sulphate is never made via calcium cyanamide. The

latter is used as a fertilizer in its own right.

An investigation has shown that production costs range from 15,000 yen to 28,000 yen per ton. Even in the supposedly low-cost A group costs go as high as 23,000 yen. Two plants with a combined capacity of 195,000 tons report costs below 16,000 yen; three with a capacity of 167,000 tons, at 16,000-17,000 yen; three with a capacity of 307,000 tons, at 17,000-18,000 yen; two with a capacity of 520,000 tons, at 18,000-19,000 yen; one with a capacity of 210,000 tons, at 19,000-20,000 yen; and seven with a capacity of 313,000 tons, at 20,000-28,000 yen.

Plants with capacities of about 50,000 tons a year are predominating among the 18 installations, but some producers with capacities of 200,000 to 250,000 tons are offering a relatively still more unattractive cost picture. It appears that, irrespective of capacity, some of the plants that depend on electrolytic hydrogen from company-owned hydroelectric stations are among the cheapest producers.

Of the 12 firms operating before the war two have dropped out as a result of territorial losses. The Korean Nitrogen Co. lost the largest plant Japanese capital ever controlled, a Casale-type installation with a capacity of 450,000 tons a year. An Uhde plant with a capacity of 240,000 tons was lost to China by the Manchu Chemical Co.

On the other hand, new firms and plants were established during the war. Conversion of coal hydrogenation plants, after the war brought the total of plants to 18, three of which are controlled by a single firm, Tovo High Pressure Ltd.

India's Plastic Producers Plan Raw Material Units

Bombay—A factory to manufacture basic raw materials for the manufacture of plastics has been voted by member firms of the All-India Plastics Manufacturers' Association. The step was taken after President B. D. Garware reported British suppliers could deliver the necessary production equipment.

The action follows an increasingly restrictive import policy which has threatened many of the Indian plastics producers with a shutdown. The Indian industry is still a small one, producing less than 3,000 tons a year.

Brief . . .

Rio de Janeiro—E. F. Drew & Co. Ltd. plans to establish a plant in Sao Paulo to manufacture chemicals used in the textile industry. —End

Murphy Paint Co., Ltd., subsidiary of Pittsburgh Plate Glass Co.

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But savings are also of important concern to Murphy Paint and they report, that in their case, *Automatic Sprinklers* will pay for themselves through reduced insurance rates in about five years. That's INVESTMENT PROTECTION, considerably less costly than would be fire destruction. It's substantial reason why executives in all types of business are specifying *Automatic Sprinklers* for both old and new construction. They've made them their first line of fire defense and, ***you should too.*** *They're an important investment today . . . perhaps welcomed protection tomorrow.*

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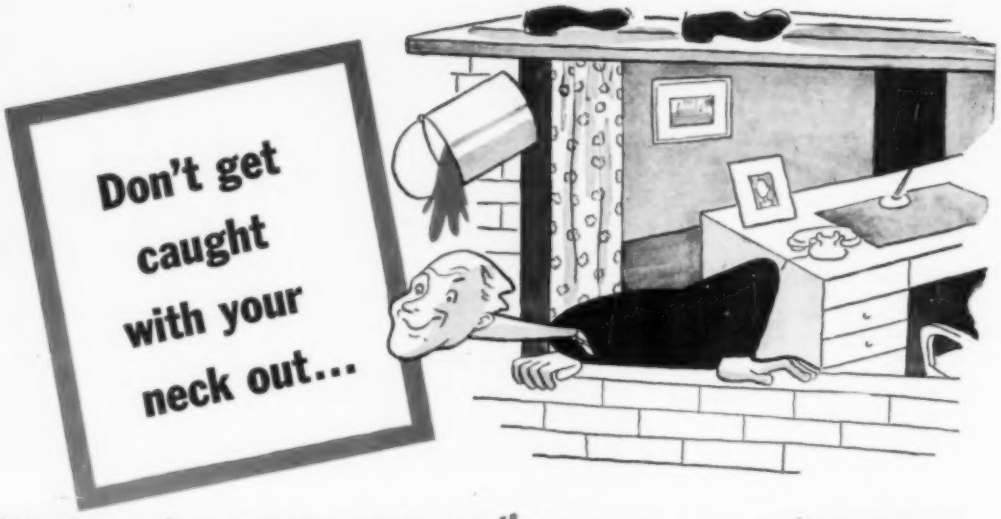

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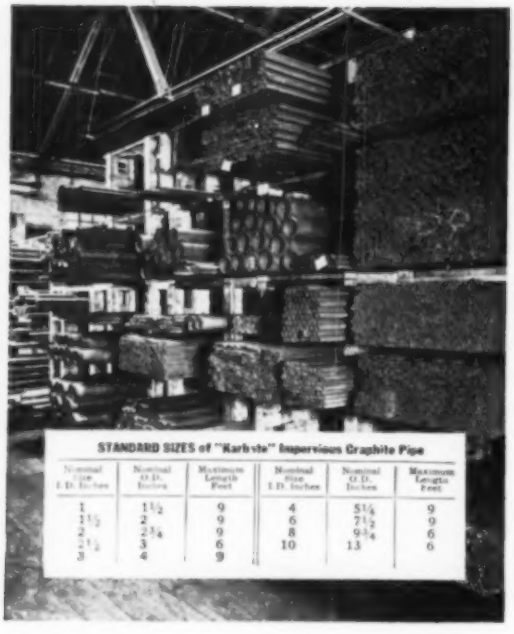

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1½	2	9	6	7½	9
2	2¾	9	8	9¼	6
2½	3	6	10	13	6
3	4	9			

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The Corrosion Forum

EDMOND C. FETTER, Managing Editor

Caustic Soda versus Construction Materials

Part I of a symposium in which a representative group of construction materials are evaluated for services involving caustic soda.

Chlorimet

WALTER A. LUCE, *Duriron Co., Dayton, Ohio*

Chlorimet 2 and Chlorimet 3 exhibit excellent resistance to all concentrations of caustic soda to very high temperatures. All data obtained indicate that satisfactory service is obtained up to the normal boiling point for all concentrations up to 80 percent with a temperature limit of 400 deg. F. for the higher concentrations. These alloys are not generally applied for normal caustic service since they are relatively high-cost materials compared to other caustic resisting alloys such as nickel, Durimet 20, Ni-Resist and others. However, the Chlorimets have been used occasionally for this service where complete interchangeability of a large number of corrosion resistant pumps was desired in addition to excellent corrosion resistance. It is usually for applications where other severe corrosives are present in addition to the caustic soda that one of the Chlorimets may be utilized.

Chlorimet 2 is a high nickel-molybdenum alloy with a nominal chemical composition of 63 percent Ni, 30 Mo, 3 Fe max. and 0.10 C. Chlorimet 3 is also a nickel base, high alloy with a nominal chemical composition of 60 percent Ni, 18 Mo, 18 Cr, 3 Fe max. and 0.07 C max. Both of these alloys are produced in the cast form only and are machinable. At present chemical equipment produced in these alloys is limited to pumps and valves, although special castings are also available. As a general rule, Chlorimet 2 should be used under reducing conditions and the chromium-bearing Chlorimet 3 under oxidizing conditions.

Chlorimet 3 is currently being used to some extent to handle caustic solutions during the continuous introduction of chlorine to make sodium hypochlorite bleach. This condition involves the highly oxidizing chlorine compounds as well as caustic soda. Although the high-silicon iron alloys, Duriron and Durichlor, have long been used in this service with excellent results, their limited mechanical properties occasionally require the use of a stronger alloy. Tests show that Chlorimet 3 is unattacked during contact with the caustic in this process.

Numerous other severe conditions are being successfully handled with Chlorimet pumps and valves. These usually involve the alternate handling of sodium hydroxide and a variety of acids which require a highly alloyed material with inherent resistance to many corrosives.

Worthite

W. E. PRATT, *Worthington Pump & Machinery Corp., Harrison, N. J.*

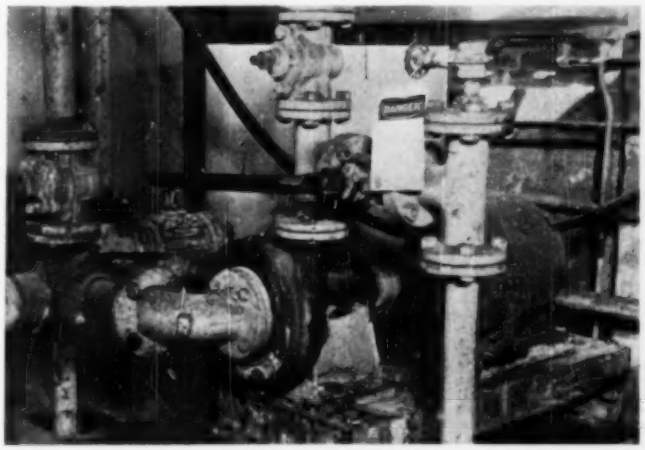
Worthite pumps were first applied for handling hot 50 percent caustic soda in 1937. The first pump, used in a plastics plant for tank car unloading to storage and for transfer from storage, is still apparently "as good as new." Maximum temperature is around 250 deg. F. As against this actual record, a recent test over a period of 34 days in a 73 percent caustic soda storage tank at temperatures ranging from 248-340 deg. F. reported high corrosion rates for all nickel-chromium alloys and chromium-nickel stainless steels, while alloys of 70 percent nickel and over showed only nominal rates of corrosion.

It may be that Worthite and the stainless steels should not be used for the 70+ percent concentrations at these high temperatures. Perhaps the quiet non-acrated conditions can be handled best by nickel or by the very high nickel alloys. Agitation inside a centrifugal pump, which prevents formation of a stagnant film of corrosion products around the alloy, may be beneficial in preventing high corrosion rates on alloys containing high percentages of chrome.

A test made this year in the 50 and 70 percent NaOH evaporators at Hooker Electrochemical Co. showed some interesting results. Two Worthite specimens were suspended for 15 days in each evaporator, one specimen was held by a nickel wire connecting to the evaporator shell while the other specimen was hung on a Teflon string, thus insulating it from metallic contact.

The appearance after the test of the specimens from the 70 percent

(*Continued*)



WORTHITE PUMP in electrolytic caustic plant, handling slurry of salt crystals in 50 percent caustic. Pumps it from evaporator to pressure filter at 40 psi.

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INSULATE WORTHITE FROM NICKEL

INSULATED

NOT INSULATED

Both these specimens were suspended in a nickel evaporator, exposed for 15 days to 70 percent NaOH at 150-200 deg. C. Top specimen hung by Teflon string, stayed bright and shiny. Bottom one was suspended by nickel wire and suffered galvanic corrosion.

evaporator is shown in these photographs. The same thing happened in the 50 percent evaporator. It is evident that Worthite is anodic to nickel in these environments and suffered some corrosion by galvanic current. The insulated Worthite specimens showed no corrosion and remained clean and bright. The difference in the corrosion rates in 70-73 percent caustic soda between exposure to quiet, stagnant conditions as reported from the storage tank tests, and the turbulent conditions inside an evaporator, are quite startling. They indicate that a Worthite centrifugal pump, insulated from nickel, may be a very economical pump to use.

Recently a plastics plant purchased Worthite pumps, fitted with mechanical seals, for high strength caustic solutions. As a precaution we told the customer of our more recent data on galvanic action between Worthite and

(Continued)

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FOR CORROSIVE SERVICE

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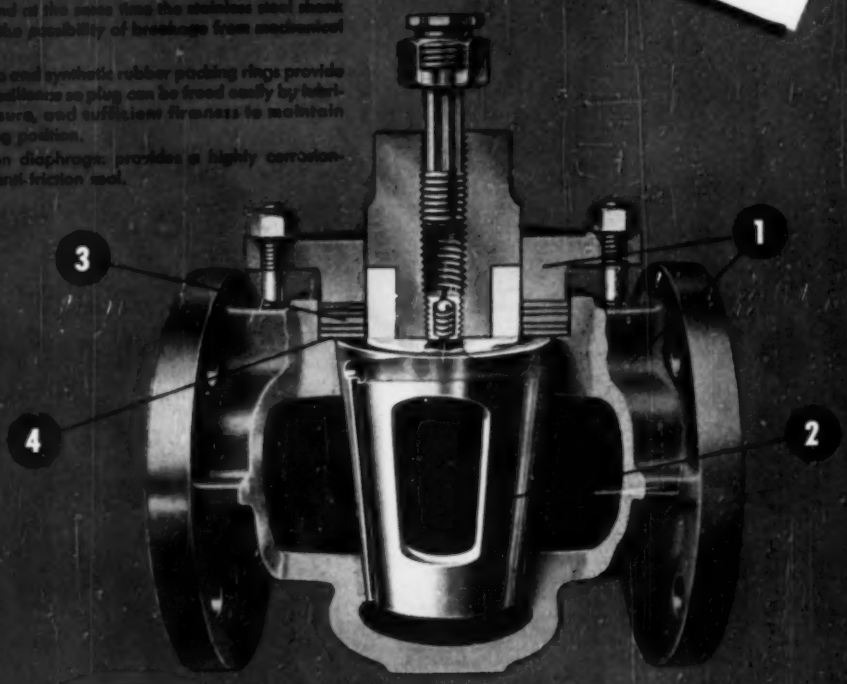
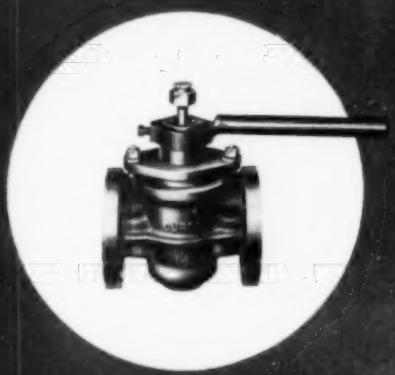
4. A Teflon diaphragm provides a highly corrosion-resistant, anti-friction seal.





The DURCO Type A is a top lubricated plug valve for general chemical service at pressures up to 150 lbs.

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Table I—Laboratory corrosion tests in 50 percent NaOH (250 deg. F., 24-hr. test). Specimens were rubbed with soft eraser between first and second weighings.

	Veloc. Ft./Sec.	First Weighing:* Corrosion Rates, Appearance of Sample		Second Weighing:† Corrosion Rates, Appearance of Sample	
		Mil/Yr.	Appearance	Mil/Yr.	Appearance
Worthite	2	0.44	bright, no pitting	1.57	bright, no pitting
Nickel	2	0.08	tarnished, no pitting	2.82	bright, no pitting
Monel	2	0.72	bright, no pitting	2.31	bright, no pitting
Worthite	5	2.12	bright, no pitting	3.00	bright, no pitting
Stainless 304	5	2.84	dark grey, blotchy	48.61	dull, etched

* Specimens washed, cleaned in acetone, dried and weighed. † Same specimens cleaned with soft rubber eraser, washed, cleaned in trisodium phosphate solution, then acetone, dried, and weighed again.

nickel, and the desirability of insulation (evaporator test, above). We were then advised that they had used Worthite pumps for many years handling 73 percent NaOH at 284 deg. F. Piping was Monel or nickel and the Worthite pumps were said to have shown no corrosion and the surfaces remained clean and bright. The probable explanation is the difference in cathodic areas: the area of their piping was small compared to that of Hooker's evaporators. At lower temperatures Worthite shows very low corrosion rates in 73 percent caustic soda. International Nickel Co. made tests on various alloys in 73 percent NaOH for a period of 110 days. Temperature varied from 194-212 deg. F. They reported a corrosion rate for Worthite of 0.2 mils per yr., while pure nickel in the same tests showed a corrosion rate of 0.1 mils per yr.

An interesting 24 hr. laboratory test was recently made on nickel, Monel, Worthite and Type 304 stainless steel in 50 percent NaOH at 250 deg. F. in the Worthington spin test machine. This device (described in Worthite bulletin W-350-B4D and in *Chem. Eng.* May 1948, p. 235) permits tests under controlled velocity conditions at any constant temperature up to 250 deg. F.

The specimens (disks 1¼ in. dia., $\frac{1}{16}$ in. thick) were all identical in size and shape. They were hung on Teflon hooks at the perimeter of a 6-in. dia. Teflon disk rotated at various speeds. The specimens on the rotating disk were subject to a relative velocity, specimen to liquid, of 5 fps. At the high temperature the Teflon hooks supporting the nickel, Monel and one Worthite specimen, straightened out so the test specimens fell to the bottom of the 3 gal. glass jar where they were subject to a relative velocity of about 2 fps. The other Worthite specimens and the Type 304 stainless specimen remained on the Teflon hooks. Weight losses were recorded after the 24 hr. test with the specimens simply washed, cleaned with acetone and dried. It was then observed that the stainless steel had a dark grey rather loose coating while the nickel showed a brown tarnish. The Monel and Worthite specimens were clean and bright. So all specimens were rubbed with a soft eraser, cleaned in tri-sodium phosphate solution, then in acetone and dried and weighed again. Table I shows results of the first and second weighings.

Cleaning the specimens with an eraser is a little unusual but it is considered a fair treatment for considering alloys for centrifugal pumps where velocities are very high and abrasion or erosion is present. (Caustic soda solutions in electrolytic plants may carry fairly high percentages of salt crystals in suspension. The accompanying photograph, for instance, shows a Worthite pump in an electrolytic caustic plant used for pumping caustic salt slurry to a filter.)

Another interesting test was recently made on a KOH-NaOH solution in a pressure evaporator containing 50 percent NaOH at 330 deg. F. Test was made by mounting Worthite specimens in a nickel holder with one specimen insulated by glass spacers from contact with the nickel. Test was run for 15 days inside the evaporator near the top of the crystallizer section where the holder was attached to a manhole cover. Specimens were exposed to normal flow and turbulence.

At the conclusion of the test it was found that the glass insulators had dissolved so it is not known how long the one specimen was insulated from contact with the nickel evaporator-crystallizer; its corrosion rate was 0.84 mils per yr. The other specimen, connected to the nickel evaporator from the beginning, corroded at 14.2 mils per yr. The test is being repeated with Teflon insulators. A 12-in. Worthite elbow propeller pump is used for circulation around the evaporator-crystallizer and so far has not yet been insulated from contact with the nickel piping.

Many hundreds of Worthite pumps are giving satisfactory service handling caustic soda solutions and caustic-salt slurries up to 50 percent NaOH and up to 250 deg. F. in the

(*Continued*)

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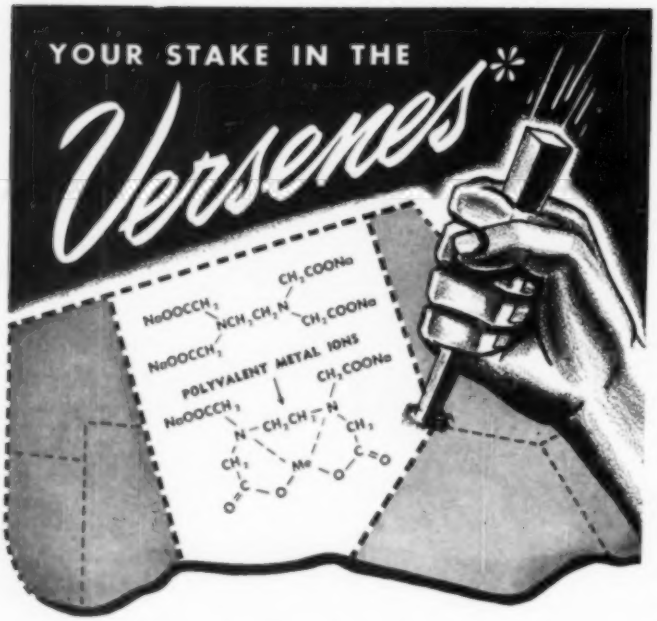

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CORROSION FORUM, *cont. . .*

following industries: Caustic manufacture by the electrolytic, lime-soda and ammonia-soda processes; and in such consuming industries as rayon and plastics, chemicals, soap, petroleum refining, lye manufacture, pulp and paper (black, green and white liquors), textile industry, rubber industry, and vegetable oil refining. Details of actual installations in any of these industries are omitted due to lack of space. An article may be published later going into detail regarding galvanic conditions which have only been encountered in isolated cases on evaporator feed, circulating and discharge pumps where very large areas of nickel and Monel are in direct contact with the Worthite pump.

Lead

KEMPTON H. ROLL, *Lead Industries Association, New York, N. Y.*

Lead is amphoteric and reacts with aqueous solutions of caustic soda to form plumbites. Because the plumbites formed are soluble in the caustic solution they cannot provide a protective surface film on the lead. However, for certain purposes or under special conditions corrosion rates are tolerable with sodium hydroxide up to 30 percent concentration at 25 deg. C, and up to 10 percent concentration at 90 deg. C. For example, lead has proved useful in the refining of petroleum where a sulphuric acid treatment is followed by an alkaline solution treatment in the same lead-lined vessel. Below are shown the results of tests by Calcott and Whetzel in which lead was exposed to a 25 percent solution of caustic soda at various temperatures:

Temperature, Deg. C.	Corrosion Rate, Mils Per Yr.
10	0.4
20	0.4
40	0.2
60	0.5
80	0.7
100	1.4

The table below illustrates the effect of varying concentration and temperature of caustic soda to which lead is exposed:

	Corrosion Rates, Mils Per Yr. 20 Deg. C.	100 Deg. C.
5% NaOH	1.1	3.5
25% NaOH	0.4	1.0
35% NaOH	0.3	0.5

The results of these tests show that cold, concentrated solutions of caustic soda have far less effect on lead than hot, dilute solutions. Except for the latter conditions, none of the results indicate that lead could not be used for handling the solutions tested.

Other tests have been recorded to

(*Continued*)

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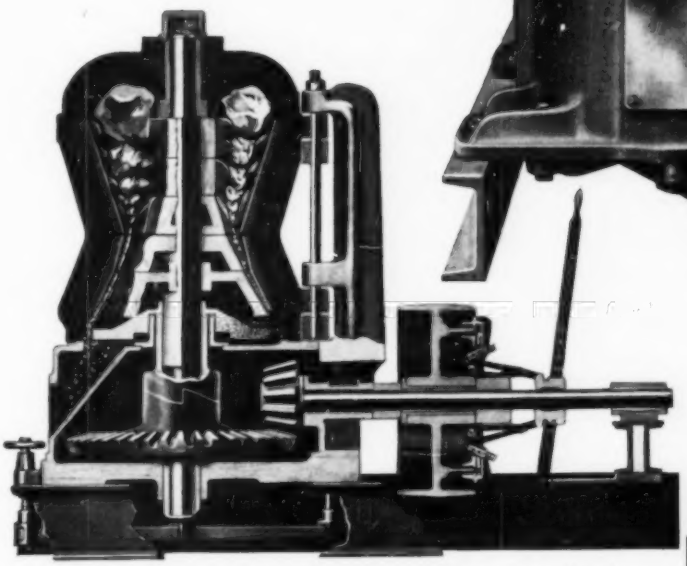

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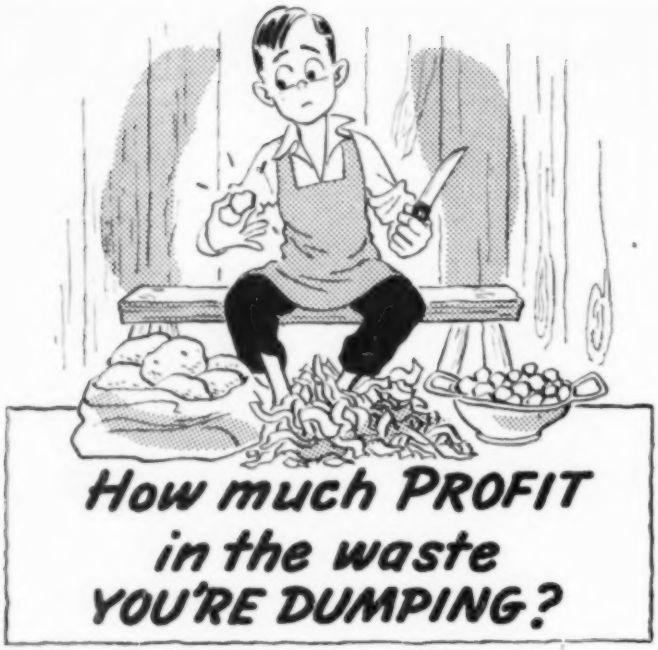

How much PROFIT in the waste YOU'RE DUMPING?

While packing plants use "*all the pig except the squeal*," most manufacturers utilize only a fraction of the raw materials they buy. The waste that remains is usually dumped — *even though it contains valuable by-products.*

Many manufacturers now look to Hersey for dryers which will recover the profitable by-products they've been dumping. Using equipment like the "*Mechanical Guinea Pig*" and drawing on their unmatched experience, Hersey Engineers have made a habit of successfully solving their problems. For example:

. . . Metal product manufacturers use Hersey Dryers to recover zinc sulfate, anhydrous and the crystals of ferrous sulfate from pickling waste.

. . . Hersey equipment is converting sweet potato pulp into cattle feed.

. . . A California beet sugar plant recovers glutamic acid from Steffens Water with Hersey drying equipment.

Waste recovery is only *one* way in which Hersey Dryers are serving industry. Others built for production and experimental use are successfully drying bulk chemicals, sand, silica gel, sawdust, sugar and hundreds of other products. *Why not write today for recommendations on your problem?*

Hersey's famous "Mechanical Guinea Pig"

The only one of its kind, this dryer was especially constructed for test drying all types of products on a limited production basis. With only minor changes *any* type of rotary dryer can be duplicated. Here Hersey Engineers give their drying theories the "acid test."

hersey·dryers

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show the effects of aeration on the corrosion rate of lead in a 1 N solution of sodium hydroxide at room temperature. Tests were run for two days following a previous two-day exposure. Here are the results:

	Corrosion Rate Mils Per Yr.
Total Immersion	
Quiet	10
Air-agitated	40
Alternate Immersion	
Continuous	690
Intermittent	280
Spray (30 days)	1

In a series of comprehensive tests conducted by Watts and Whipple lead was exposed to a 1 N solution of sodium hydroxide and results compared with lead exposed to the same solution but containing additional small amounts of such salts as sodium arsenate, potassium permanganate, potassium nitrate and sodium chlorate. It was found that all of these oxidizing agents reduced the rate of corrosion instead of accelerating it. While the test data reported here are not wholly consistent, the trends appear clear.

Glass Linings

S. W. McCANN, *The Pfaudler Co., Rochester, N. Y.*

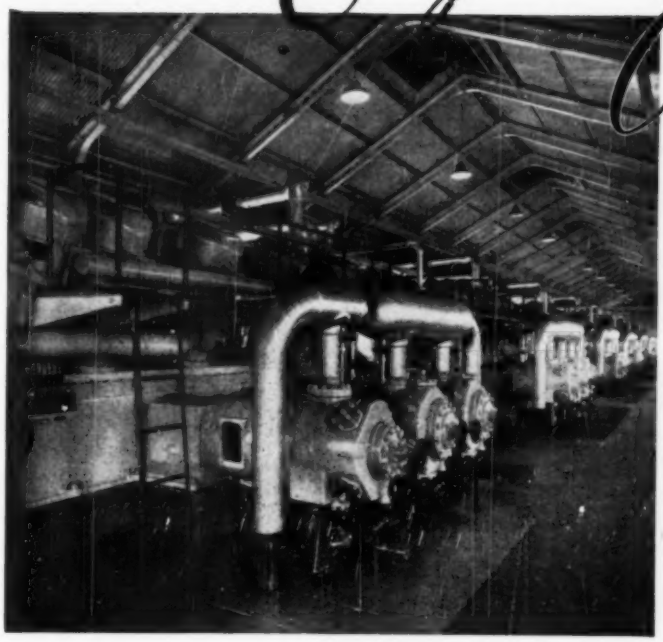
Glass lined steel is not usually recommended for caustic soda service owing to the rapid action of hot alkalis on glass. At room temperatures, or below, the action of caustic soda on glass lining is very slow.

While the action of caustic soda on glass is a function of concentration, temperature is a far more important factor. The following table shows the relative effect of caustic soda at various concentrations and temperatures on an acid resistant glass used in chemical service.

	Rate of Attack, Mils per Yr.		
	Solution at 70 Deg. F.	Solution at 150 Deg. F.	Solution at 210 Deg. F
1% NaOH	0.167	2.62	17.42
5% NaOH	0.197	14.75	48.22
10% NaOH	0.312	18.06	100.20
20% NaOH	0.232	20.30	79.20

The question most frequently met involves existing equipment that a user wishes to subject to caustic soda service. In many cases the glass lining can be subjected successfully to contact with caustic soda provided the concentration and temperature are low or time of contact short. In some cases a slight etch on the glass surface has not limited the life of equipment. Hot caustic soda solutions are capable of completely removing glass linings, therefore caution should be used before subjecting existing equipment to such service. —*End*

BACK OF *Every* INGERSOLL-RAND *Compressor* ARE THESE *Sup*R*values*



This 7000-hp installation of Ingersoll-Rand KVG 4-cycle V-angle gas-powered compressors serves a natural-gas conservation program. The gas is gathered from producing oil wells and stripped of its liquid content. The high-pressure residue gas is then distributed to industrial centers where it is fully utilized.

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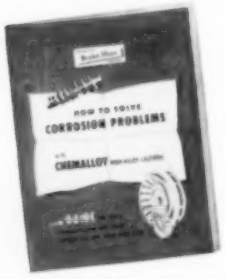
Corrosive Media	Concentrations	°F	Chemalloy Grade	A28	A28M	A45	A53N	F12 F30	H1, 2	H3	H4	H 1 to 5 Ni-Base
			AISI Types	302 304 347	316	310		410 442				
Hydrochloric Acid	All %	70		X	X	X	X	X	G	G	G	X
Hydrofluoric Acid	All %	Boil		X	X	X	X	X	G	G	G	X
	5%	70		G	G	G	G	X	G	G	G	X
Hydrogen Peroxide	Dry	70		G	G	G	G	X	G	G	G	X
Iodine	Wet	70		G	G	G	G	X	G	G	G	X
	All %	All		G	G	G	G	X	G	G	G	X
Lactic Acid	5%	70		G	G	G	G	X	G	G	G	X
Lead Acetate				G	G	G	G	X	G	G	G	X
Lead Nitrate				G	G	G	G	X	G	G	G	X
Lysol				G	G	G	G	X	G	G	G	X
Magnesium Carbonate	Conc.	70		G	G	G	G	X	G	G	G	X
Magnesium Chloride	5%			G	G	G	G	X	G	G	G	X
Magnesium Hydroxide				G	G	G	G	X	G	G	G	X
Magnesium Sulfate				G	G	G	G	X	G	G	G	X
Malic Acid				G	G	G	G	X	G	G	G	X
Mercuric Chloride				G	G	G	G	X	G	G	G	X
Mercurous Sulfate				G	G	G	G	X	G	G	G	X
Mercurous Nitrate				G	G	G	G	X	G	G	G	X
Milk		200 & 140		G	G	G	G	X	G	G	G	X
Mixed Acid	50-50 & 75-25	Boil		G	G	G	G	X	G	G	G	X
	50-50 & 75-25	Boil		G	G	G	G	X	G	G	G	X
	70-10			G	G	G	G	X	G	G	G	X
Mine Waters				G	G	G	G	X	G	G	G	X
Naphtha	All %	All		G	G	G	G	X	G	G	G	X
Nitric Acid	All %	70		G	G	G	G	X	G	G	G	X
	Conc.	Boil		X	X	X	F	X	F	G	G	F
	Up to 65%	Boil		X	X	X	F	X	F	G	G	F
Oleic Acid		All		G	G	G	G	X	G	G	G	X
Oleum	All %	70		G	G	G	G	X	G	G	G	X
Oxalic Acid	10%	Boil		G	G	G	G	X	G	G	G	X
	10%	All		G	G	G	G	X	G	G	G	X
	All %	180		G	G	G	G	X	G	G	G	X
Phenol	All %	70		G	G	G	G	X	G	G	G	X
Phosphoric Acid	10%	Boil		G	G	G	G	X	G	G	G	X
	10%	70		G	G	G	G	X	G	G	G	X
	5%			G	G	G	G	X	G	G	G	X
Picric Acid				G	G	G	G	X	G	G	G	X
Potassium Chloride				G	G	G	G	X	G	G	G	X
Potassium Hydroxide		70		G	G	G	G	X	G	G	G	X
Potassium Nitrate	1-5%	Boil		G	G	G	F	X	G	G	G	F
Sea Water				G	G	G	G	X	G	G	G	X
Sodium Bicarbonate	10%			G	G	G	G	X	G	G	G	X
Sodium Bisulfate				G	G	G	G	X	G	G	G	X



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Names in the News

MAN OF THE MONTH

Walter Murphy

The American Institute of Chemists recently announced the recipient of its 1950 Gold Medal. Cited as "a great editor who has focused the world's attention on chemists and their contributions as professional men," the award will be presented to Walter J. Murphy next May.

Brooklyn-born Walter Joseph Murphy received his B.S. in chemistry from Brooklyn's Polytechnic Institute in 1921. After graduation, he joined the research staff of Air Reduction Co. In 1922 he went with American Cyanamid Co. where he was in technical and sales development work and traveled widely in Latin America. He did special work for Naugatuck Chemical Co. in 1925 investigating New England market possibilities. Then for two and a half years he was vice president of W. G. George Chemicals, Inc., and vice president of the subsidiary Seaboard Crystal Co. In 1928 he became sales assistant to the president of the Mutual Chemical Co.

With this experience in research, sales and marketing, Dr. Murphy was well qualified to accept the position of associate editor of *Chemical Markets* in 1930. In 1939, editor-publisher Williams Haynes sold the magazine (which in 1933 had changed its name to *Chemical Industries*) and Murphy was made editor and manager.

Late in 1942 the directors of the American Chemical Society named him to the editorial posts of the late Harrison E. Howe. He is now editor of *Industrial and Engineering Chemistry, Chemical and Engineering News* and *Analytical Chemistry*. He is also a director of the ACS News Service.

Dr. Murphy is a fellow of the AIC. And in addition to ACS, is a member of SCI, AIChE, the Salesmen's Association of the American Chemical Industry, Pi Kappa Phi, Sigma XI and Alpha Chi Sigma. He received the honorary degree of doctor of science from Centre College in 1947, was elected to the Washington Academy of Science in 1948, and last August was appointed to the AEC Advisory Committee on Technical Information for Industry of which S. D. Kirkpatrick is chairman.

The editors of *Chemical Engineering* are pleased to have this opportunity to congratulate a colleague upon this recognition by the American Institute of Chemists of Walter's "noteworthy service to the science of chemistry and the profession of chemist in America."

A. T. Waidelich has been elected vice president in charge of research for the Austin Co., Cleveland. He will supervise independent research projects, plant location surveys and economic and engineering reports.

A. T. Waidelich

H. E. Ries, Jr.

Herman E. Ries Jr. of the Sinclair Refining Co.'s research laboratories at Harvey, Ill., has been awarded the $3,000 Ipatieff Prize in Chemistry for 1950 by the American Chemical Society. He was cited for his work on catalysts, particularly those used in petroleum hydrocarbon conversion.

Peter VanWyck and **Richard S. George** have been appointed to two newly created posts at Hercules Powder Co.'s experiment station in Wilmington, Del. Dr. VanWyck, formerly technical assistant in the research department, has become assistant director of the experiment station responsible for the work done by the cellulose products, explosives and Virginia cellulose research division. Dr. George, formerly manager of the naval stores research division, has been named assistant director responsible for the work done by the naval stores, paper makers chemical and synthetics research divisions.

Edwin A. Meier has been named technical assistant to the manager of the General Aniline Works division plant of General Aniline & Film Corp., Grasselli, N. J. **Dr. Hans Beller** will replace Dr. Meier as manager of the sulphur colors and textile auxiliaries department.

S. C. Hope

H. G. Burks, Jr.

Stanley C. Hope has been elected president of Esso Standard Oil Co. and **H. G. Burks Jr.** has been named executive vice president. Mr. Hope has served as president of two other Jersey Standard affiliates, Gilbert & Barker Mfg. Co. and Stanco, Inc. **M. W. Boyer** has been appointed vice president and contact director of manufacturing supply and transportation and chemical products operations.

O. B. J. Fraser, assistant manager, development and research division, International Nickel Co., has been elected president of the American Welding Society for the year 1949-50.

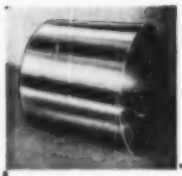
Harold E. Billings has been made supervisor of product control for the production department Baroid sales division, National Lead Co., New York.

Fred H. Haggerson, president of Union Carbide and Carbon Corp., New York, has been awarded the 1949 Medal for the Advancement of Research presented by the American Society for Metals.

Irving Langmuir, associate director of the General Electric research laboratory, Schenectady, N. Y., has been awarded the Mascart Medal. He is the second American scientist to receive the honor awarded triennially by the French electrical engineering society.

James G. Knudsen has been appointed assistant professor of chemical engi-

(*Continued*)



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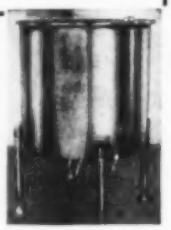

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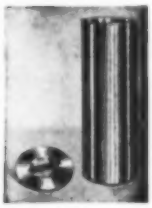

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NAMES IN THE NEWS, cont. . .

neering at Oregon State College, Corvallis, Ore.

Edward F. Everett, Jr., has been added to the engineering department of Houdry Process Corp., Philadelphia, Pa. He will serve as senior process engineer. He was formerly with the Marshall-Morman Development Co. of New York.

Leland H. Burt has been appointed supervisor of cellulose gum development for Hercules Powder Co., Wilmington. **Werner C. Brown** will supervise the gum sales.

F. Denig

G. F. D'Alelio

Fred Denig, vice president, has been made manager of the production department of Koppers Co., Pittsburgh, Pa. He replaces **Hugh C. Minton** who has resigned because of ill health. **G. Frank D'Alelio** has been named vice president and manager of the research department, the position formerly held by Mr. Denig. Before joining Koppers in 1947, Dr. D'Alelio was director of General Electric's plastics laboratories and previously head of research for the Pro-phy-lac-tic Brush Co.

M. C. Forbes, formerly with Celanese and Pan American Refining Corp., has gone into the consulting business specializing in water treatment. He is president of Aquatrol, Inc., Houston, Tex.

Roy E. Paul has been made superintendent of the Tarpon Springs, Fla., plant of Victor Chemical Works, Chicago, Ill.

E. J. de Ridder has joined the staff of technical service engineers of Reynolds Metals Co., Louisville, Ky.

William J. Murray, Jr., has been re-elected chairman of the board and chief executive officer of McKesson & Robbins, Inc., New York.

I. Milton Colbeth has been elected president of the Baker Castor Oil Co. He has been with the company for 30 years. Most recently he has been chemical director and then vice president of the operating division in complete charge of all technical and manufacturing operations.

Alfred E. Brown has been appointed assistant director of research for Harris Research Laboratories, Washington, D. C. **Anthony M. Schwartz** has been made manager of the industrial chemicals division.

William L. Madison has joined the product development department of Bristol Laboratories Inc., Syracuse, N. Y., as a senior chemist.

Robert A. Speck and George R. Milne have been appointed vice presidents of National Carbide Corp., New York. Mr. Speck will be in charge of sales and distribution, Mr. Milne in charge of operations.

Perry R. Taylor has been appointed executive officer of the nation's 11-man Water Pollution Control Advisory Board.

Abbott K. Hamilton has been appointed a vice president of Commercial Solvents Corp., New York.

Ralph E. Brewer, chemical engineer in the United States Bureau of Mines central experiment station, Pittsburgh, Pa., has been elected chairman of the American Chemical Society's division of gas and fuel chemistry.

Thomas L. Mahony has been appointed research director for Dome Chemicals Inc., New York.

James Green has retired as superintendent of the Pittsburgh Plate Glass Co. plant at Creighton, Pa.

Harry H. Houston, former vice president of the Brooks Mfg. Co., Knoxville, Tenn., has joined the staff of Armour Research Foundation of Illinois Institute of Technology.

Otis C. Dermer has been elected chairman of the American Chemical Society's division of chemical education. He is head of the department of chemistry at Oklahoma A. & M. College.

John L. Collyer, president of the B. F. Goodrich Co., Akron, has been named to the Munitions Board Advisory Committee on Military-Contractor Relations.

Glenn Purcell has been named assist-

ant superintendent of the Houston plant of Shell Chemical Corp. He was formerly senior technologist in the Shell Oil Co.'s head office manufacturing department in New York.

Marshall F. Allen has been appointed manager of the Magnesia Insulation Mfrs. Association.

Henry W. Gadsden, director of pharmaceutical production and engineering, and **W. W. Lauer, Jr.**, director of industrial relations, have been elected vice presidents of Sharp & Dohme, Inc., Philadelphia.

H. W. Gadsden

B. Chertow

Bernard Chertow has joined the staff of the chemical and engineering development division of Bristol Laboratories Inc., Syracuse. Dr. Chertow was formerly an assistant professor at Massachusetts Institute of Technology.

Curtis E. Maier has been made general manager of research for Continental Can Co., New York, succeeding **Allen L. Malone.** Mr. Maier was formerly assistant to the vice president in charge of research and engineering.

Percy E. Landolt, consulting chemical engineer of New York, has been reelected president of the Association of Consulting Chemists and Chemical Engineers, New York.

Bernard H. Shoemaker, assistant director of research for Standard Oil Co. (Indiana), has been chosen chairman-elect of the petroleum division of the American Chemical Society.

Oscar M. Havekotte has resigned as president of International Derrick and Equipment Co. and as a director of Dresser Industries.

John A. Stierstorfer has been appointed senior synthetic enamel chemist at the Stamford, Conn., branch of the Atlas Powder Co.'s industrial finishes department.

Ralph L. Evans, president of Evans Chemetics and Evans Research and

(Continued)

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NAMES IN THE NEWS, *cont. . .*

Development Corp. has been awarded the 1949 Medal Award of the Society of Cosmetic Chemists.

F. E. Satterthwaite has been appointed quality control engineer of the plastics division in the chemical department of the General Electric Co., Pittsfield, Mass.

Marius Van de Weghe has been appointed superintendent of the plastics division of the Colt's Mfg. Co., Hartford, Conn.

Harry F. Pfann has been appointed manager of the product development department of Pittsburgh Coke & Chemical Co., Pittsburgh, Pa. Formerly, he was with Koppers Co. as manager of the chemical development section.

H. F. Pfann

B. C. Redmon

Bryan C. Redmon has been appointed assistant director of organic chemical research by U. S. Industrial Chemicals, at the company's Baltimore laboratories.

Verne H. Schnee, formerly assistant director of Battelle Memorial Institute, has been named director of the University of Oklahoma Research Institute in Norman.

Frank R. Ward, formerly in the production department, plastics division, Monsanto Chemical Co., is now with the reactor development division, U. S. Atomic Energy Commission, Washington, D. C.

Max L. Murdock has been made manager of the centrifugal pump department at Allis-Chalmers Norwood (Ohio) Works. **Woodrow Brixius** has been made his assistant.

John L. Gillis has been made general manager of Monsanto Chemical Co.'s Merrimac division.

Oskal Wintersteiner, head of the division of organic chemistry at the Squibb Institute for Medical Research, New Brunswick, N. J., has been awarded the William H. Nichols Medal of the American Chemical Society's New York section for 1950.

J. P. Miller, Katharine L. Armstrong, and Lacy R. Overby have been added to the nutritional research staff at Abbott Laboratories, North Chicago, Ill.

Ross O. Watson has joined Hercules Powder Co., Wilmington, Del., as a chemical engineer in the naval stores division. **Warren E. Belknap** has been made a chemical engineer in the analytical division.

Robert L. Murray has been elected a director of Detrex Corp., Detroit. He is also executive vice president and a director of Hooker-Electrochemical Co., Niagara Falls.

Winston I. Parks has been appointed research and public relations director of Adams Steele, Inc., Chicago.

John C. Bailar Jr. of the University of Illinois has been elected chairman of the division of physical and inorganic chemistry of the American Chemical Society.

Ray P. Johnson has been appointed administrative assistant to the executive vice president of Borg-Warner Corp., Chicago.

Vincent C. Hall, Jr., has become associated with the applied physics department of National Research Corp., Cambridge, Mass.

Richard H. Barnes has been named to the newly-created post of assistant director of research for Sharp & Dohme, Inc., Philadelphia.

C. G. Kirkbride, vice president of research and development of Houdry Process Corp., Philadelphia, has been reelected secretary of the division of petroleum chemistry of the American Chemical Society.

Louis Ware has resigned as a member of the board of directors of U. S. Gypsum Co., Chicago.

R. D. Waterman has been appointed executive vice president of E. B. Badger & Sons Co., Boston. Three vice presidents have been elected: **A. J. Broggini** as sales manager; **A. J. Connell** as engineering manager; **A. J. Good** as office manager.

Harold E. Cohen has become a research assistant with the Institute of Industrial Research of Syracuse University. He was formerly with the engineering department of the

Solvay process division of Allied Chemical and Dye Corp.

Benjamin M. Siegel has been made head of Cornell University's new electron microscopy laboratory.

Bjorn F. Benson has been appointed a member of Industrial Rayon Corp.'s research staff at Cleveland.

B. F. Benson

R. S. Warner

Roger S. Warner has joined the staff of Arthur D. Little, Inc., Cambridge, Mass. He was previously director of engineering for the Atomic Energy Commission. In this capacity he was in charge of the postwar construction program, developing improved chemical processes such as those for recovery of uranium and plutonium, and disposing of radio-active wastes.

Joseph D. Grandine has joined the research staff of the Du Pont Co.'s rayon department in Buffalo, N. Y.

Cary Shoemaker, sales engineer, has been transferred from Birmingham, Ala., to Knoxville, Tenn., by Continental Gin Co., Birmingham.

E. W. Sweeney, Sr., has been made manager of the Oklahoma City division of Carpenter Paper Co.

Manuel Pedreira has been appointed manager in Puerto Rico for Winthrop-Stearns Inc.

Burton H. Greenwood has joined the Burtonite Co., Nutley, N. J., to direct sales and technical activities.

Samuel S. Smith has been made general manager of the liquid filling equipment division of MRM Co., Brooklyn, N. Y.

Thomas F. Fitzgerald has been appointed engineering sales representative in the Boston area for Hammond Iron Works, Warren, Pa.

John F. Walton, Jr., and John P. Knight have been made general sales manager and assistant general sales manager, respectively, of special accounts and federal govern-

(Continued)

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Mr. Jack Strong, Newark, N. J., Manager of THE EAGLE-PICHER COMPANY plant, reports . . . "We are using GEMCO VALVES for many of our operations and they are tops . . . We recommend to anyone needing a valve that DOES NOT STICK, FREEZE OR LEAK, TRY GEMCO."

The seat is self cleaning . . . it is scraped by the ground disc as it closes, ever ready for quick, continuous action.

Send for new low prices!

General Machine Company of New Jersey

Established 1916

SPECIAL CHEMICAL AND MIXING MACHINERY • SPHERICAL VALVES

400 MARKET STREET • NEWARK 5, N. J.

VORTRAP

For Centrifugal Separation of Solids from Liquids

☆ Over 10 years experience in paper industry removing grit and foreign particles from paper stock.

☆ Many successful applications on pigments and slurries for removing grit—sand—or oversize particles.

☆ Solids removed in large quantities from coal wash waters.

☆ Various sizes of Vortraps lend flexibility in handling Large or Small Volumes.

Write for Bulletin No. 211-B

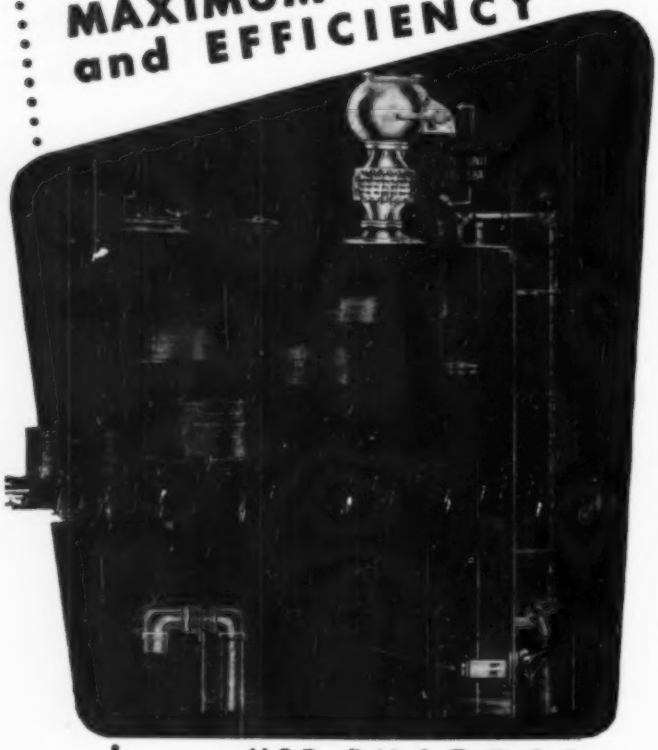
NICHOLS Engineering & Research Corp.

70 Pine Street – New York 5, N. Y.

40 S. Los Robles Ave., Pasadena: Calif.

1477 Sherbrooke St. W., Montreal 25, Canada

DESIGN YOUR LIQUID STORAGE FOR
MAXIMUM SAFETY
and EFFICIENCY



USE "VAREC"
PROVED & APPROVED
TANK EQUIPMENT

Will you be planning additional storage facilities for your liquid products? If so, you'll want your tank builders to meet strict requirements for all your tanks, but you can make doubly sure of safe and efficient storage by including "VAREC" equipment in your plans.

There are "VAREC" Tank equipment and Safety Devices for all types of tanks . . . and for all types of storage problems. Your file copy of the "VAREC" P-7 Catalog has full details.

CP-9

PROVED and APPROVED "Varec"

THE VAPOR RECOVERY SYSTEMS COMPANY
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TULSA 409 TULSOMA BLDG. HOUSTON 821A M. & M. BLDG.
CABLE ADDRESS: VAREC COMPTON (ALL CODES)

NAMES IN THE NEWS, cont. . .

ment sales, Gulf Oil Corp., Pittsburgh, Pa. **L. F. Craig** has been made general sales manager of special products.

John A. Steer has been appointed New York district manager for Yarnall-Waring Co., Philadelphia.

K. O. Stowell has been made plant manager of Deep Rock Oil Corp.'s Cushing, Okla. refinery. **J. F. McDonald** has been made assistant chief engineer.

Ollie Middlebrooks has been appointed general superintendent of the Continental Carbon Co., Sunray, Tex., plant, and the Witco Carbon Co., Eunice, N. M., plant.

H. R. Salisbury has been appointed president of Air Reduction Sales Co., New York.

Henry T. Sulcer has been appointed general manager of Graver Water Conditioning Co., New York.

J. Y. Sammons has been added to the industrial chemical sales staff of Spencer Chemical Co., Kansas City, Mo. He will represent the company in New York.

Charles T. Snow has been appointed to represent the Geo. P. Reintjes Co., Kansas City, Mo., in Louisiana, Florida, lower Mississippi and southern Alabama.

Harris C. Miller has been promoted to the sales staff of Hooker Electrochemical Co., Niagara Falls. He has been assigned to New York City.

H. F. Finnell, Jr., has been named Pacific Coast sales manager for Phelps Dodge Copper Products Corp. He will be located in Los Angeles.

Fred Thilenius has been appointed manager of the mid-continent district of France Packing Co., Philadelphia. He will be located in Tulsa, Okla.

Marvin W. Smith, president of the Baldwin Locomotive Works, has been elected a director of Westinghouse Electric Corp., Pittsburgh, Pa. **Harry J. Deines** has been named manager of advertising and sales promotion for Westinghouse.

Harold D. Gobble, formerly manager of the oil field division of Fairbanks, Morse & Co., Chicago, has been ap-

pointed manager of the Dallas, Tex., branch house.

Frederick D. Rossini has been appointed professor and head of the chemistry department at Carnegie Institute of Technology. He was formerly chief of the thermochemistry and hydrocarbons section of the National Bureau of Standards.

F. D. Rossini

C. R. Bragdon

Charles R. Bragdon, manager of the special services department of the Interchemical Corp., New York, has been elected chairman of the division of paint, varnish and plastics chemistry of the American Chemical Society.

Amos W. Oakleaf has been appointed sales manager in charge of furnace blacks for Phillips Petroleum Co., Bartlesville, Okla. He will be located in Akron, Ohio. **Robert B. Prock** has been made manager of the Los Angeles district fertilizer sales division.

Spencer R. Griffiths has been appointed assistant sales manager of Unistrut Products Co., Chicago.

Floyd J. Gunn has been made head of coatings sales for Dow Chemical Co., Midland, Mich.

Lincoln T. Work of the Powdered Material Research Laboratories, Cambridge, Mass., has been elected chairman of the American Chemical Society's division of industrial and engineering chemistry. **Arlie A. O'Kelly**, associate director of research and development for Socony-Vacuum Oil Co., has been elected chairman of the division of petroleum chemistry for the society. **S. K. Love** of the United State Geological Survey has been elected chairman of the division of water, sewage and sanitation chemistry.

Walter H. Aldridge, president of Texas Gulf Sulphur Co., has received the John Fritz Medal for 1949.

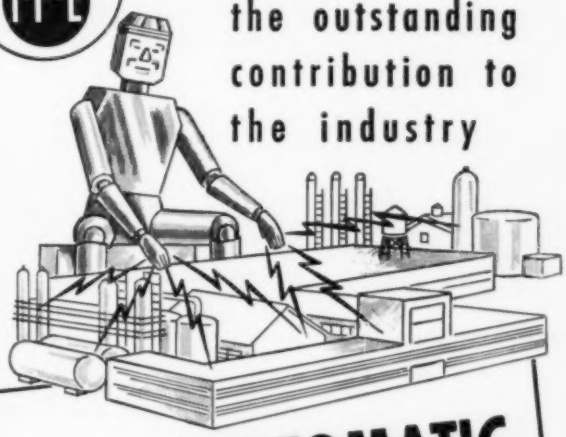
Kenneth Conwell has been appointed sales representative in the New York

(Continued)

I·P·E

Announces...

the outstanding contribution to the industry



Completely **AUTOMATIC PROCESSING PLANTS**

A giant step beyond conventional automatic process-variable control, I•P•E Robotization creates a plant which is set in motion, scheduled for daily output, and regulated by two master control switches. All other plant operations are performed by standard control instruments integrated with highly engineered systems of electronic and pneumatic inter-locks.

For existing plants and processes and for those in the design stage I•P•E Robotization offers these positive advantages:

1. Lowest possible labor costs
2. Highest attainable product quality
3. Uniform and continuously reproducible results
4. Greatest possible savings of raw material
5. Elimination of possible human error
6. Maximum efficiency in use of utilities
7. Elimination of breakdown due to overloading
8. Automatic checks on instruments

Requests for informative discussion, authoritative literature, actual proposal, or any additional information will be promptly honored.

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INDUSTRIAL PROCESS ENGINEERS

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DENSE, POROSITY-FREE WELDS..

. . . Welding of Exchanger 16" x 5'0" long with HELIARC. By this method, *very dense, porosity-free* welds can be produced in metals (aluminum, everdur, etc.) that previously gave some difficulty in welding.

We of DOWNINGTOWN, solicit your inquiry for heavy duty shell and tube equipment:
Alloy materials, including aluminum, inconel, nickel, phosphor bronze, or welded copper. Many of these are welded by Heliarc. Bimetal and finned tube jobs, to our own performance designs. Impregnated graphite jobs for very high corrosion resistance. Special stainlesses, for difficult service conditions.
Design and construction meet standard of A.S.M.E. or other agency specified by customer. All equipment of our design is sold on a guaranteed performance basis. We also fabricate to customer's drawings. Modern facilities available for checking welding operations by X-RAY. Write on your letterhead for DOWNINGTOWN literature on shell and tube heat exchangers.

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DOWNINGTOWN, PA.
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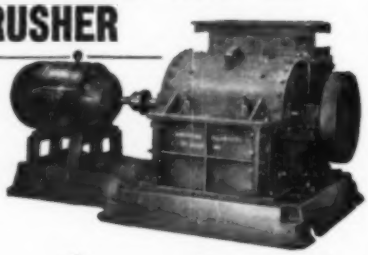
ASSURE UNIFORM REDUCTION *plus* HIGH TONNAGE with an AMERICAN CRUSHER

There's no need to sacrifice control of uniformity to gain high tonnage reduction of your materials. Efficient American Type 24 Crusher reduces all hardness of fibrous and friable materials quickly and uniformly, to assure dependable, high tonnage production—at low cost. Easy, external adjustments give a flexibility to accommodate a wide variety of materials —and a wide range of sizing.

The rugged, balanced American rotor can be equipped with rolling rings or shredder rings—or rotor can be supplied for any of three hammer types—to give you the flexibility and exact reducing action you require.

Write for information on the complete line of Americans.



American PULVERIZER COMPANY
Originators and Manufacturers of Ring Crushers and Pulverizers
1219 Macklind Ave.
St. Louis 10, Mo.

NAMES IN THE NEWS, cont. . .

office of Monsanto Chemical Co.'s organic chemicals division.

Kent L. Wilson has been named manager of the newly formed manufacturers' division of Minneapolis-Honeywell Regulator Co.

Paul G. Blazer, Reid Brazell, M. H. Robineau, E. L. Shea, and W. S. Zehrung have been appointed members of the general committee of the division of refining for 1950 for the American Petroleum Institute.

John S. Tinsley, research group leader of Hercules Powder Co., Wilmington, has been elected chairman of the American Chemical Society's division of cellulose chemistry.

Charles E. Crowley has been elected president of Alsop Engineering Corp., Milldale, Conn.

Kenneth A. Dunbar has been appointed director of the office of production and engineering in the Atomic Energy Commission's office at Oakridge, Tenn.

Robert S. Marvin and Richard N. Work have joined the staff of the National Bureau of Standards.

L. H. Perry has been named head of the hydraulic department for the Holyoke Machine Co., Holyoke, Mass.

OBITUARIES

Emerson Davis, 71, president of the Detroit Chemical Works, Detroit, died with his wife in the S. S. Noronic fire at Toronto, Ontario, September 17.

Harry R. Neilson, 55, died at his home in St. Davids, Pa., September 27. He was a director of Merck & Co., Inc.

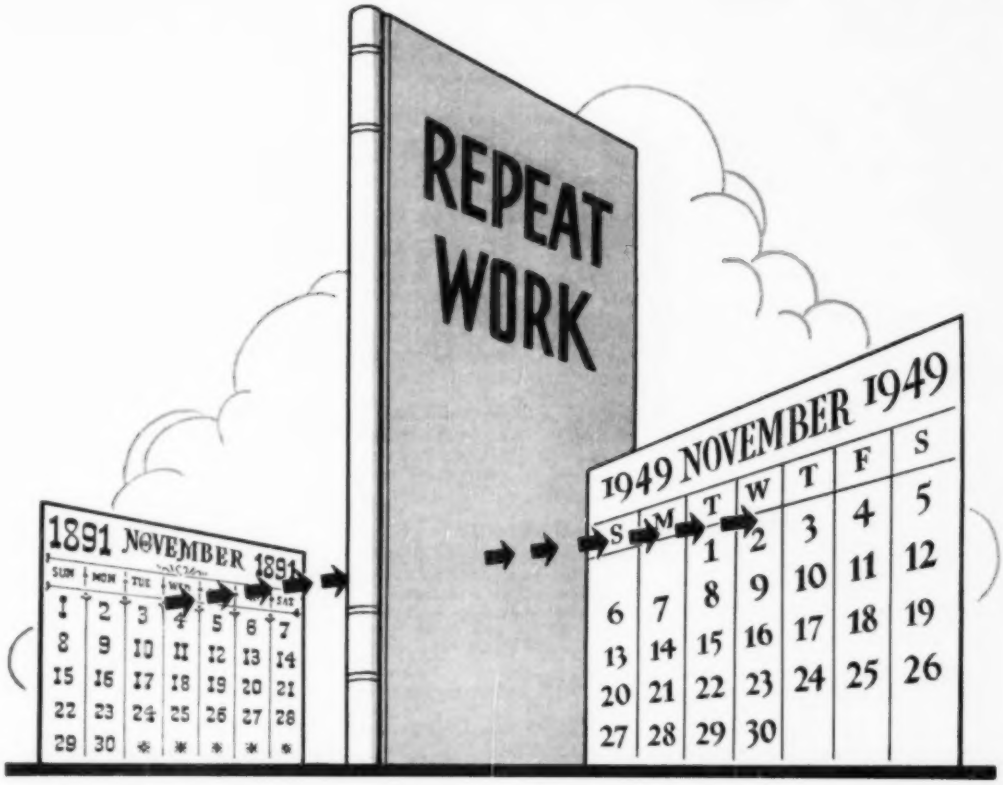
Louis Ruprecht, founder and president of the Pulverizing Machinery Co., Summit, N. J. died on October 13.

George S. Bays, 60, consulting engineer for Stanolind Oil and Gas Co., died October 19.

Royall O. E. Davis, soil and fertilizer scientist, U. S. Department of Agriculture for 40 years, died unexpectedly October 30.

Louis A. Grundner, 42, head of the chemical laboratories at the Lincoln Electric Co., died in Cleveland November 3.

A MEASURE OF SATISFACTION



80% of all the construction work we have completed since 1891 has been for clients previously served – a tangible measure of client satisfaction.

80%

STONE & WEBSTER ENGINEERING CORPORATION

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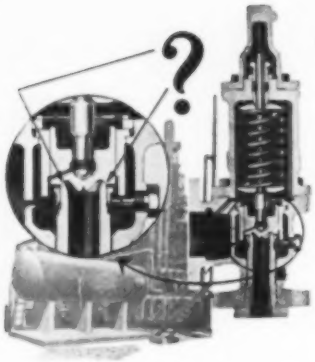

Why the *Outside* Bevel Seat?

The Outside Bevel Seat and Floating Guide construction supplied only in CONSOLIDATED Safety Relief Valves provides the *flexibility* which eliminates leakage despite bolting strains and discharge piping stresses.

The outside bevel seat permits movement of the disc on a radial seating surface and assures tightness in all positions within the deflection range.

Additional CONSOLIDATED features include fixed *built-in* capacity which cannot be accidentally altered during maintenance, single ring blow-down control, and simplicity of design with maximum interchangeability and 25% fewer parts.

Specify CONSOLIDATED for maximum safety.

CONSOLIDATED SAFETY RELIEF VALVES

A Product of

MANNING, MAXWELL & MOORE, INC.

TULSA, OKLAHOMA

Makers of 'Consolidated' Safety and Relief Valves, 'American' Industrial and 'Microsen' Electrical Instrument, 'Hancock' Valves and 'Ashcroft' Gauges. Builders of 'Shaw-Box' Cranes, 'Budget' and 'Load Lifter' Hoists, and other lifting specialties.

INDUSTRIAL NOTES

Pine Bluff Chemical Co., Pine Bluff, Ark., has been sold to the Niagara chemical division of Food Machinery and Chemical Corp. by the Michigan Chemical Corp.

Day Co., Minneapolis, has opened a sales and service office in Chicago under the direction of Frank F. Vytlacil.

Jas. P. **Marsh Corp.**, Skokie, Ill., has formed three sales affiliates. The Electrimatic Co. will handle refrigeration control valves and regulators; Marsh Instrument Co. will sell pressure gages and dial thermometers; Marsh Heating Equipment Co. will sell traps, valves and other heating specialties.

Chemsteel Construction Co., Pittsburgh, Pa., has formed Affiliated Furnace & Engineering, Inc., to specialize in design, construction and maintenance of industrial furnaces.

Kaiser Engineers, Inc., has changed its name to Kaiser Industries, Inc. The engineering and construction division will continue to be known as Kaiser Engineers.

Abbe Engineering Co., New York, has acquired the plant, equipment and designs of the Kent Mill Co., Brooklyn.

American Blower Corp., Detroit, will erect a manufacturing and assembly plant at San Leandro, Calif. Operation will produce heating, cooling, drying and ventilation equipment as well as gyrol fluid drives for power in industry.

Eagle Oil & Refining Co., Los Angeles, plans for the purchase of controlling stock and interest in Sunset Oil Co. Thomas F. Fournier, president of Sunset Oil Co., also a Los Angeles firm, says a sale will be completed soon.

Pittsburgh Agricultural Chemical Co., a division of Pittsburgh Coke & Chemical Co., has established a regional warehouse and sales office in Denver. E. C. Stone is in charge of the Denver office.

Electro Chemical Supply & Engineering Co. has moved its office from Paoli, Pa. to its new plant and office at 750 Broad St., Emmaus, Pa. Recently reorganized, the company now includes among its officers: C. R. Payne, president; J. W. Grant, vice president and sales manager; W. A. Sesher, treasurer and production manager.

Geo. P. Reintjes Co., Kansas City, Mo., has appointed Interstate Sales, Inc., St. Louis, Mo., to represent it in the St. Louis area.

Salyun Laboratories has been opened in Santa Barbara, Calif., to engage in research on pharmaceutical products. Melville Salyun, formerly director of research of the Frederick Stearns and Co., division of Sterling Drug Inc., will head the organization.

Logan Engineering Co. and **Dor-O-Matic Co.** have merged. The latter company becomes the Dor-O-Matic division of the Logan organization.

Gil-Lair Products, Inc., Pasadena, Calif., has been formed by J. M. Gilmore and Lee J. Laird. The new firm will manufacture a ball-bearing swivel pipe coupling.

Librascope, Inc., manufacturing computing machines, expects to move into its new $500,000 plant at Glendale, Calif., early in 1950.

Graver Water Conditioning Co. has moved its general offices to 216 West 14th St., New York 11, N. Y. The new location houses sales and engineering offices, chemical laboratory, and a pilot plant.

Protective Papers, Inc., Union, Ill., has installed new equipment to manufacture pipe line wrapping material.

Graver Water Conditioning Co., New York, has established sales and field engineering offices at Cleveland, Suite 1101, Hippodrome Bldg., and at Philadelphia, Suite 1012, Commercial Trust Bldg.

Lester, Hankins and Silver, Philadelphia, has been formed to help builders and distributors of machinery, equipment and technical products in their management, distribution and sales problems.

De Laval Steam Turbine Co., Trenton, N. J., has opened a district office in Tulsa, Okla. Harold Meyer

(*Continued*)

Only NYTRON

TRADE-MARK REG. U. S. PAT. OFF.

SOLVAY'S *NEW SYNTHETIC ORGANIC DETERGENT*

gives you this versatile combination of properties

✓ **NYTRON HAS EXCEPTIONAL DETERGENCY** for use in institutional cleaning, manufacturing plants, industrial processes, dairy cleaning, and in the compounding of a wide variety of products; can be used alone, or combined with acids or alkalies.

✓ **NYTRON COUNTERACTS HARD WATER DIFFICULTIES;** more economical because increased quantities do not have to be added to compensate for water hardness; completely prevents the formation of scum, grease rings, streaks, spots.

✓ **NYTRON HAS HIGH SOLUBILITY;** water solutions containing as much as 36% NYTRON can be prepared at 77°F.; will not "salt out" in concentrated solutions of many metallic salts.

✓ **NYTRON REDUCES WETTING TIME** from a matter of hours required in plain water to a matter of seconds; produces splendid results under a wide variety of conditions.

✓ **NYTRON REMAINS CHEMICALLY STABLE** under extreme conditions of temperature, acidity or alkalinity; suffers no chemical breakdown or loss in detergency when used in solutions of either weak or caustic alkalies.

✓ **NYTRON REDUCES SURFACE TENSION** even under extremely varying conditions; addition of only 3½ ounces to 100 gallons of water will reduce surface tension by more than 50%; this action is actually enhanced under hard water conditions.

✓ **NYTRON RINSES THOROUGHLY, QUICKLY** in cool or even cold water; does not leave an insoluble deposit.

✓ **NYTRON HAS EXCELLENT EMULSIFYING POWER** to remove oil and grease from fabrics, surfaces, metal parts.

✓ **NYTRON WILL FOAM** in any normal concentration of acid or alkali, in distilled or sea water, in ice cold or boiling water.

A SOLVAY PRODUCT

This low-cost synthetic organic detergent is made by a new, exclusive, patented process. It is a basic product with a chemical structure unique in the synthetic organic detergent field. Get detailed information and specific technical data on how NYTRON can help your business.

Mail the coupon today

SOLVAY SALES DIVISION, Allied Chemical & Dye Corporation
40 Rector Street, New York 6, N. Y.

I want to know more about NYTRON, the entirely new type (patented) synthetic organic detergent, and what it can do for my business. Please send me detailed non-technical information and specific technical data on NYTRON.

Name .....

Title .....

Company .....

Type of Business .....

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City ..... *State* CE-12

Hendrick Shur-Site Treads —for stairs, ladders, fire escapes

provide all the advantages of Hendrick Mitco Open Steel Flooring—square-edge, uniformly spaced bars that afford a non-slipping, level walking surface; minimum interference with light because of 90% open area; no obstruction to ventilation; strength and rigidity that insure long service.

A conspicuous, heavy flanged nosing-bar at edge of each tread—a valuable safety feature—also provides reinforcement where load is greatest. Write for Hendrick Mitco Products catalogue.

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Manufacturing Company
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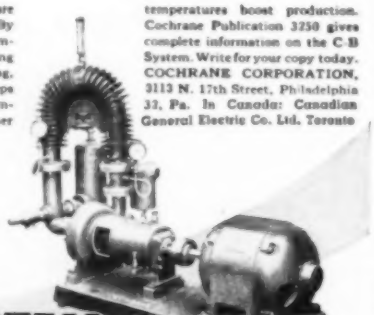
Sales Offices In Principal Cities

Perforated Metals
Perforated Metal Screens
Architectural Grilles
Mitco Open Steel Flooring
"Shur-Site" Treads and Armorgrids

Chemical Manufacturer Saves $3300 a year

Before installation of the Cochrane C-B System of Condensate Drainage Control, flashing of condensate being returned to the boiler from scattered asphalt and flux tanks caused a Chicago chemical manufacturing company to keep feed water make-up at about 55%. Condensate is now returned to the boiler by a Cochrane C-B System at 85 p.s.i. (327° F.) with a reduction of 20% in make-up. Resulting boiler efficiencies, lower maintenance and steam costs have saved the company $3300 annually.

C-B Systems in every process industry are registering similar savings for owners. By returning condensate to boilers at high temperature and high pressure, and eliminating entrained air from jackets, coils, and piping, the C-B saves valuable heat units—keeps process equipment at consistent high temperatures. Steam costs are reduced. Higher temperatures boost production. Cochrane Publication 3250 gives complete information on the C-B System. Write for your copy today. COCHRANE CORPORATION, 3113 N. 17th Street, Philadelphia 32, Pa. In Canada: Canadian General Electric Co. Ltd. Toronto



COCHRANE C-B SYSTEM OF CONDENSATE DRAINAGE CONTROL

INDUSTRIAL NOTES, cont. . .

has been appointed manager. Lefler Wymont Supply Co., Casper, Wyo., has been appointed to represent De Laval in Wyoming and Montana. Roger Brown Co., El Paso, Tex., has been appointed to represent them in southern New Mexico and southwestern Texas.

Hungerford & Terry, Inc., Clayton, N. J., has appointed the following distributors for its water treating plants: Walton and Best, Cleveland, northern Ohio and northwestern Pennsylvania; Allan K. Cook Co., Kentucky; C. J. Gaskell Co., western Tennessee and eastern Arkansas.

R. S. Aries & Associates, Brooklyn, N. Y., has opened a branch office in Stockholm, Sweden.

Speedways Conveyors, Inc., Buffalo, N. Y., has appointed three distributors to handle wheel and roller gravity conveyors and endless belt boosters—in Baltimore, the McCall-Boykin Co.; in Detroit, Bentley & Hyde; in southern California, Robt. H. Braun Co. of Los Angeles.

Minneapolis-Honeywell Regulator Co., has bought a one-story factory building to accommodate expansion made necessary by stepped-up activity of the special products division.

Culpepper Hertz Inc. has been formed by F. M. Culpepper and D. B. Hertz to specialize in quantitative research on all types of management problems.

Industrial Models, Wilmington, Del., has opened a branch model shop at 67 Fulton St., New York, N. Y. Malcolm Stewart has been appointed manager.

Waukesha Foundry Co., Waukesha, Wis., has appointed Mooney Brothers Corp., Teterboro, N. J., its industrial distributor for the New York-New Jersey area.

Truman B. Wayne & Associates, Houston, has moved to 1011 Waugh Dr.

Emulsol Corp., Chicago, has made Theodore Riedeburg and Associates, New York, its technical sales representative in the agricultural, industrial and sanitation chemical fields in the state of New York and upper New Jersey.

Fidelity Chemical Products Corp. has moved to 470 Frelinghuysen Ave., Newark, N. J. —End

TIMKEN 18-8 STEEL TUBES Shows the best combination of creep strength, oil corrosion resistance and oxidation resistance up to 1500°F.

TIMKEN SICROMO 9 M STEEL TUBES This steel possesses the maximum corrosion resistance of any of the steels below the stainless group.

TIMKEN SICROMO 7 STEEL TUBES For applications requiring better corrosion resistance than can be obtained with 5% Chromium type steels.

TIMKEN SICROMO 5 S STEEL TUBES For oxidation resistance to 1500°F. Good creep strength and corrosion resistance to 1300°F.

TIMKEN 4-6% CR MO STEEL TUBES For service up to 1200°F. Superior corrosion resistance. Less oxidation resistance than Sicromo 3.

TIMKEN SICROMO 3 STEEL TUBES For service up to 1200°F. Have excellent oxidation resistance and good corrosion resistance.

TIMKEN SICROMO 2 STEEL TUBES For service up to 1200°F., where better scale resistance is required than can be obtained with 2% Cr. ½% Mo. Steel.

TIMKEN 2¼% CR-1.0% MO STEEL TUBES For service up to 1150°F. Has greater resistance to creep than 2% Cr. ½% Mo. Steel.

TIMKEN 2% CR½% MO STEEL TUBES For service up to 1150°F. Intermediate corrosion resistance plus good creep strength, fair oxidation resistance.

TIMKEN D M STEEL TUBES For service up to 1150°F. This steel offers outstanding creep strength.

TIMKEN CARBON-MO STEEL TUBES For temperature up to 1000°F. Improved creep strength makes it safer than carbon steel.

TIMKEN CARBON STEEL TUBES Generally for service not exceeding 900°F., where corrosion and oxidation resistance are not important.

Tube costs too high? Tube life too short?

Look here for the best LIFE/COST *ratio!*

GETTING the right balance between low cost and the service life you need from your high temperature tubes is a job for a specialist. And maybe you're missing out on a big saving because you haven't yet found the right steel for your particular application.

Here's where metallurgists of The Timken Roller Bearing Company can help!

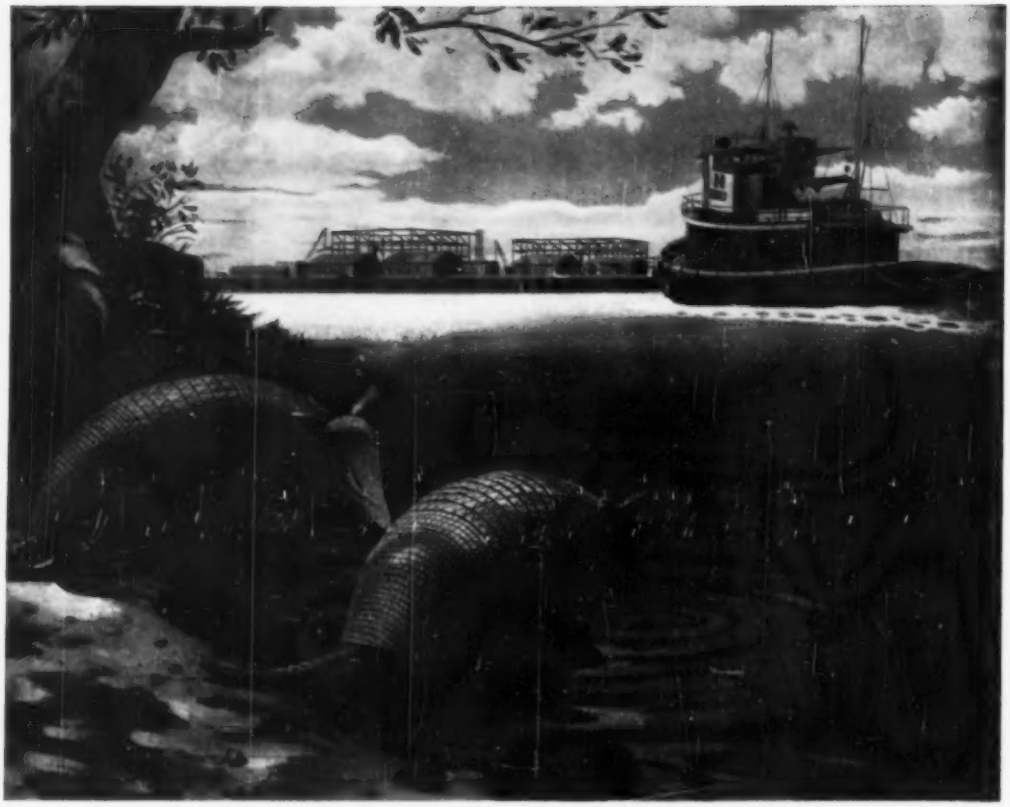
Each of the 12 steels listed here is tailor-made to meet specific operating conditions. By analyzing your problems, metallurgists at Timken® can help you select the *one* steel which best meets your needs and gives you the *maximum tube life per dollar invested.* You can depend on their recommendations because 20 years of experience and research have made them the recognized authorities on high temperature tubing applications.

Whichever analysis is selected, you can be sure that every shipment of Timken tubes will give you the same quality performance. That's because the Timken Company closely controls quality through every step in production, from melt shop to finished tube inspection.

To get the best life/cost ratio from your tubes, call on the Timken Technical Staff now. Write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

50th birthday of the company whose products you know by the trade-mark: TIMKEN

Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing.



SPECIALISTS IN *Southwest* CONSTRUCTION

To the Industrial Developer with Southwestern Plans:

It has been proved many times that the problems confronting industrial construction in the Southwest are unique to the area itself . . . that the solution to these problems is most readily acquired from an organization having complete and accurate knowledge of terrain, soil, climatic and working conditions peculiar to this section.

Brown & Root, Inc., today stands as the foremost construction and engineering concern in the Southwest. Its experience is based on thirty years of successful engineering enterprise.

If you have Southwestern plans, Brown & Root's experience will prove invaluable to you.

BROWN-BILT

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CABLE ADDRESS — BROWNBILT

Associate Companies:— BROWN ENGINEERING CORP. • BROWN & ROOT MARINE OPERATORS INC.

Quotes, Extracts and Digests

LESTER B. POPE, Associate Editor

"Here's a little new product box score we have been keeping on studies we have been asked to make:

Unqualified acceptance.....	21%
Accepted with qualifications....	36%
Rejected with qualifications....	14%
Unqualified rejection.....	29%

Note that only one-fifth of the proposed new products studied would have had probable acceptance had they actually reached the market. This is not conclusive, but gives some idea of the risks involved in marketing a new product."

—H. B. Idleman

Market Researcher Tells How to Evaluate New Fields of Interest

As professional research people, how do we go about evaluating the market opportunities for a new product? An illustration of an approach to such a study happens to be heat-resistant coatings. This approach is easily adaptable to a multitude of chemical products, provided: (1) the problem is one that can be solved by obtaining a certain number of specific facts; (2) the facts themselves can be obtained by getting answers to specific questions.

Despite the technical nature of chemical product development and chemical market research, these can be done in most instances. Consider this question: "Shall our company which now manufacturers allied products, enter the field of heat-resistant, protective coatings?" What facts should this manufacturer know in order to decide on that question?

It seemed to us in this case that there were five main ones: (1) Is there a need for such products? (2) If there is a need, what types of industry need them? (3) How much of the product is needed? (4) How does the proposed product compare with what is now being used? (5) What are some of the problems that have to be met and overcome in order to get a share of the market?

But one more question remained before we could proceed toward seeing what could be done about obtaining these facts, and that was the question of how expensive such a study would be. In this particular case the budget was limited. The question was: "Can we get fairly reliable indications without going to all of the expense which would be necessary for precise, definitive results?"

What we usually do in such cases is to suggest a limited number of preliminary interviews. These give an indication of what is likely to be found in a more extensive survey, by revealing some of the significant facts for or against the acceptance of the product. They tell us who, among plant personnel, can answer our questions. They point the direction which the main survey should take—the fields to investigate and ways to go about it.

For the purposes of the preliminary survey, we wanted to go to industries that were likely to have a need for heat-resistant coatings. It was logical to assume that the greatest need would be found among those industries where fairly high operating temperatures prevailed. Consequently, it was decided that we would interview 36 concerns selected from these industries: 7 iron & steel products and foundries, 7 utilities, 4 chemicals, 4 steel producing, 3 petroleum refineries, 2 glass, 2 railroads, 1 coke, 1 mfg. of power equipment (boilers, oven, motors, turbines, etc.) and 5 miscellaneous.

For these preliminary surveys the instructions stipulated that the interviews should be detailed and penetrating. We wanted the interviews to be essentially exploratory in nature; and even though the questionnaires were detailed as specifically as possible, our interviewers were instructed to record, verbatim, any of the respondents' comments or observations that had a bearing on the problem.

The findings of our preliminary survey were: 26% definitely interested in the coating, 42% possibly interested and 22% not interested.

When these results were analyzed, however, it was found that, of the concerns lacking interest in every case but one the maximum temperature to which metal surfaces were exposed was 700 deg. F. or less. And the lone concern operating at higher temperatures didn't need protective coatings. It began to look, therefore, as if the interest in heat-resistant coatings would be more likely if the temperatures exceeded 700 deg.

In any case, the degree of interest expressed by the concerns interviewed in the preliminary survey was encouraging enough to go ahead with the main survey.

Based on these findings, it was decided to concentrate interviews in the main survey among larger companies where metal surfaces were exposed to temperatures of 800 deg. F. and up. We concluded that if we did that, it would not be necessary to specify the type of industry to be interviewed.

It is necessary, of course, that the research project be conducted by people who: (1) Know the industrial concerns in their areas, and will use care and judgment in selecting ones to call on. (2) Have entrée to the concerns they wish to interview. (3) Enjoy the confidence of key persons in industrial plants so they can get the information needed.

We selected the main survey sample on the basis of our branch office knowledge, with a telephone check to verify temperature conditions. The questions asked in the main survey paralleled the preliminary survey, except that the questionnaire was shorter, and far less stress was put on the exploratory nature of the interview. It was largely a matter of find out: (1) What plant equipment or surfaces were exposed to high temperatures, and how hot did they get? Were there any special problems due to acid, grease, or other contaminating

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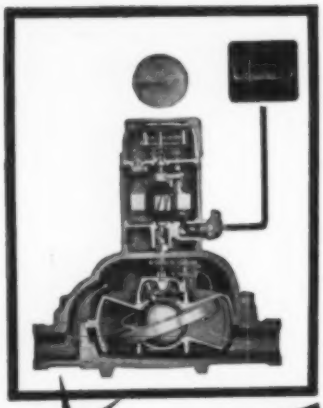

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substances? (2) How the equipment was being protected—at the time—and the source of whatever material was being used. (3) Was the current protective method used satisfactory—and if not, in what specific regard was improvement needed—cost, resistance to corrosion, peeling, etc.? (4) Would the proposed product be suited to the needs of the industrial concern? (The proposed coating was described to them, and verbatim answers were recorded.) (5) Assuming the protective coating worked satisfactorily, how many gallons per year would be required to protect all exposed surfaces?

SURVEY FINDINGS

It is interesting to note the distinct difference in the degree of interest reported, between the main survey and the preliminary survey—due to restricting the main survey to plants contending with temperature problems of 800 deg. F. and up.

	Main Survey %	Preliminary Survey %
Definitely interested	64	36
Possibly interested	19	42
Not interested...	17	22
	100%	100%

This gave us the first set of facts. There appeared to be little doubt but that industrial plants where temperatures ran over 800 deg. F. had a need for high heat-resistant coatings.

When the findings were analyzed, we found that in certain industries nearly every company interviewed was interested in the proposed coating. Among these industries were manufacturers of coke, glass, and power equipment.

In the chemical industry, 90 percent of the concerns interviewed were interested. Companies producing plastics, coal tar products, soap, glycerine and sulphur products all were interested, while manufacturers of industrial alcohol and commercial solvents were not.

Foundries revealed specialized problems. Thirteen out of 17 were interested; but, three out of the remaining four contended with temperatures from 2,000 deg. to 2,600 deg., which they felt were too high to protect against, except through insulation. The fourth had an acute problem of oil, dirt, and grime which caused peeling of any coating applied. Similar specialized conditions existed in the 23 public utilities interviewed—13 were interested and 10 were not.

Thus, we found that the need for protective coatings was not uniform for all types of industry surveyed. In order to evaluate our findings, therefore, we grouped the 13 types of industries interviewed into three main classes: (1) Where all, or nearly all, companies appeared to be prospects. (2) Where a substantial proportion were prospects. (3) Where a relatively small proportion were prospects.

We then examined each of these three groups in the light of two other factors: (1) The number of plants in each industry, and their regional concentration. (2) The indicated annual requirements, in terms of gallons of material each plant might use.

This showed that some of the industries in Group 2, were probably better prospects than those in Group 1. The steel producing industry, for example, was classified in Group 2, but appeared to offer the best marketing opportunity. Quantity requirements per plant were usually large enough to merit solicitation. Indicated requirements per plant, ranged from 25 to 3,000 gal. annually, with an average of 300 to 600 gal. Manufacturers of power equipment were the No. 2 market. Petroleum refining appeared to be the third best market with 485 potential users. Requirements were 400 gal. per year and up.

The No. 4 market was apparently in the non-ferrous metals industry. This was a Group 2 industry, but since there are 1,721 plants, and average requirements reported were 100 gal. each, it appeared to be well worth soliciting. Fumes were an acute problem in this field, however, and that situation would have to be overcome if attractive sales volume were to be obtained.

Two additional questions remain: competition and getting a market. Many prospects had either had disappointing experiences with other heat-resistant coatings, or were uninformed that any such protective coatings were available. On the basis of user's testimony, no single heat-resistant coating stood out as superior. Of the 30 brands mentioned as having been tried, 8 competitive products were found to have been generally used, but every one of these was mentioned by two or more respondents as having been found unsatisfactory for their use.

That led to these conclusions: (1) A need existed for an outstanding heat protective coating but industrial plant personnel would be quite skeptical of whether a new product could fill the bill. (2) The sale of such coatings would demand an engineering approach and considerable technical knowledge. (3) A technically trained sales force—working directly under the factory would be necessary. (4) The proposed product would have to

THIS MONTH we present abstracts of the five papers given at the joint meeting of the Chemical Market Research Association and the Commercial Chemical Development Association held in Philadelphia October 19.—EDITOR.

perform according to claims made for it.

One other selling problem was indicated. Combustion engineering firms, and construction engineers usually specify the protective coating on the original installation, and are frequently consulted on maintenance problems. Close contact would be necessary with the technical men in these organizations.

Each new field has its own peculiarities, in general we can say that what we are trying to do in evaluating new fields of interest is to bring together industrial concerns that need something and the manufacturer who can produce it. It is perfectly feasible to survey industrial plants in order to determine what their needs are, and what specifications a product would have to have to fulfill those needs.

It boils down to deciding what facts we want to get and what questions we have to ask in order to obtain them. When we can reduce our research problems to these fundamentals, and when we have at our disposal outside agencies that can locate and interview the types of industry that we want to know something about, there is very little that isn't capable of solution.

H. B. Idleman, Dun & Bradstreet, before the Commercial Chemical Development Association and Chemical Market Research Association, Philadelphia, Oct. 19, 1949.

MARKET RESEARCH

. . . *Evaluating Markets*

Fred T. Schreier

The larger the number of users of a product, the more industrial research must approximate the methods of consumer research. If the number of users or prospective users of the product is very small, then we may undertake to approach everyone and to interview each one in detail. If, however, the number of users is very large, then statistical methods become increasingly important. Careful sampling is indispensable; and the grouping, tabulating, and cross-tabulating of the results will finally decide the value of the survey.

Prediction may be ventured that consumer research will become more

(*Continued*)

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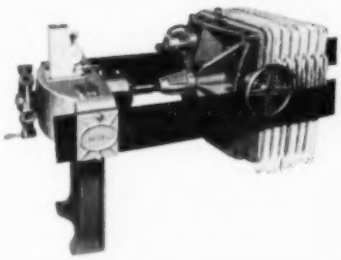

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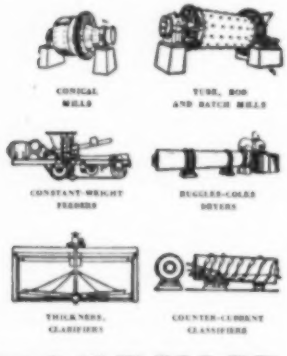

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and more important and more and more accepted in the chemical industry. The trend toward replacement of products of nature by chemical artifacts is unmistakable. More and more, therefore, marketing in the chemical industries will have to rely on sound consumer research.

Consumer research is survey work, interviewing of individuals, and not purely internal work such as analysis of economic data or sales figures. Sales research and consumer research should be sharply divided. The topic of consumer research is the human element —those who buy or do not buy. Sales analysis deals primarily with transactions and dollars. Consumer research deals with the people engaged in those transactions. The unit of sales analysis is either a transaction or a dollar. The unit in consumer research is a person and his or her behavior, habits, attitudes and opinions.

The field of consumer research as defined may now be divided into two parts—the evaluation of the market for a product that is being sold in this market and the evaluation of a market for a new product. The two parts are interrelated, particularly in the problem of expansion of an existing market—in expansion research, to apply a coined term.

Descriptive consumer research covers the following problems: What is the proportion of the users of the product in the total population? What is the share of the company's brand in this proportion, and how does this brand share compare with the brand share of others? It cannot be stressed strongly enough that any consumer research of an existing market has to be on a comparative basis, presenting the marketing situation in the broadest sense of this work for the brand produced by the firm studying the situation with the competitive brands or products.

Breakdowns by personal characteristics are not the only type of breakdowns. It is very useful for example to divide the various buyer groups into types by amount of consumption—heavy, moderate, and light users.

From these tabulations and breakdowns, profiles can be developed showing the characteristics of the buyers of specific brands. It may appear, for example, that heavy users are more inclined to buy one specific brand than light users. Obviously, these differences are blurred in sales figures.

While the descriptive analysis takes stock of the situation as it exists, the explanatory market research is engaged in finding the causes for this existing situation. Very roughly speaking, there are four factors which are responsible for the standing of a brand in the market, for its success or failure—the product, distribution, advertising, and public relations, that is, the attitudes of the dealers or the consumers toward the product or brand.

The aim of a study of the product is not reached when we know the proportion of users who accepted or rejected it. We must dig deeper and try to ascertain on what qualities of the product acceptance or rejection rests.

The impression that consumer research should proceed according to one formula and be rigidly standardized would be entirely wrong. The methods of consumer research are very flexible and each problem requires specific approaches and taxes the ingenuity of the researcher.

Fred T. Schreier, A. J. Wood & Co., before the Commercial Chemical Development Association and Chemical Market Research Association, Philadelphia, Oct. 19, 1949.

MARKET RESEARCH

. . . *Use Consultants*

Richard B. Schneider

Since the problem of introducing new chemicals to potential users is becoming increasingly complex, it is more imperative than ever that carefully considered suggestions regarding product application be made to prospective consumers by prospective new producers. In reducing the time required and the expenditure for both evaluating the potential markets and tailoring the individual products to meet existing needs, a well-integrated industrial consulting organization can play a significant part.

Consider a few of the particular features which an industrial company rightfully should expect in an adequately diversified and objective consulting organization. For one thing, there should be impartiality of opinion and judgment. There should be suitable integration of technical and economic experience within fields where the producer has traditionally been active. A sufficiently well-rounded consulting staff can reflect rather broad industrial backgrounds and make this experience available to the interested client. Furthermore, through the use of a consulting group the prospective producer's identity can usually be protected if desired pending establishment of both the technical and economic feasibility of manufacturing and distributing a new product and the final decision to erect a commercial plant.

NO SUCH ANIMAL

"There is no such thing as 'a little government regulation.' You either have it or you don't. Once it starts in one segment of the industry it will never finish until it has covered every phase of the industry."

B. K. Browns, *President*
Pan American Petroleum Corp.

Launching a new industrial product is a complicated venture, as all of you know only too well, and any reduction in effort and cost through the supplemental activities of outside agencies should prove more advantageous to industrial companies.

Richard B. Schneider, Arthur D. Little, Inc., before the Chemical Market Research Association and the Commercial Chemical Development Association, Philadelphia, Oct. 19, 1949.

MARKET RESEARCH

...*Sales Performance*

Donald R. G. Cowan

Once again, business management is keenly interested in measuring sales performance. The easy selling conditions of a ready-made market during the past eight years have made it possible for a complacent self-satisfied attitude to creep into many sales organizations. The tendency for selling expenses to take an increasing share of the buyer's dollar, evident for decades before the war, has been emphatically resumed in manufacturing as a whole and in the chemical industry.

There is evidence that in many companies selling expenses are increasing while sales volumes are declining, and the selling expenses per dollar of sales are rising abruptly.

While sales managers will always exercise personal judgment in evaluating salesmen's performance, to depend on it entirely is outmoded in a day when industrial management has turned to more objective standards in evaluating plant worker's performance.

The devising of standards of performance has been approached from several different viewpoints. Experience indicates four main categories for consideration. (1) The use of measured market potentials with which to compare sales volume. (2) The use of time and motion standards, resembling those developed by industrial engineers for plant workers, with which to compare the physical activities of the salesmen. (3) The use of proved interview techniques as standards and observation of the extent to which salesmen use them in contracts

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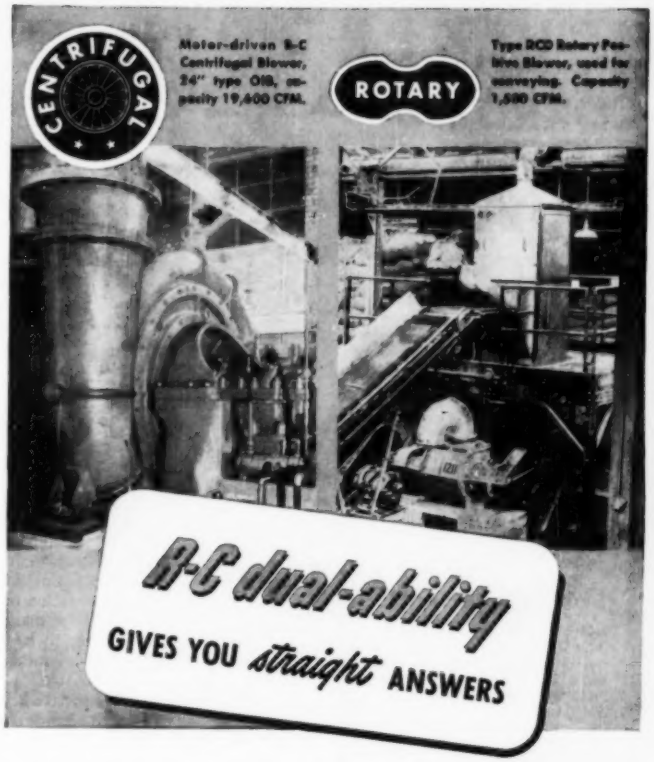
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with customers. (4) The use of profit potentials for each customer and each area against which to compare the salesmen's ability to combine the elements of product volume, prices and expenses in making a profit.

Volume Potentials—Sales managers have usually been most concerned with volume possibilities and accomplishments from time to time, and it is not surprising that volume potentials and sales quotas became the first standard of performance, attaining more frequent use than other standards.

For industrial goods, such as chemicals, studies of the growth of individual industries and companies and the effect of seasonal and cyclical influences upon their buying of raw and semi-finished materials can be related to a company's sales of industrial products.

Regional markets for most products are usually affected and measured by several market factors rather than a single index. Fortunately the method of simple and multiple correlation provides a method of testing for market factors, properly weighting their influence and converting them into regional potentials.

Sales of many chemical materials for processing may be correlated with data regarding plant output, number of employees and total hours worked in specific occupations, numbers and capacities of machines for specific manufacturing operations, fuel and power consumption and many other possible factors indicating the use of chemicals. This information may often be collected by salesmen or survey techniques which, by correlation methods, may be converted into dependable potentials which in turn provide standards for measuring performance.

Physical Effort—Many companies keep more or less complete records of the physical activities of salesmen, such as the calls made each day, and compare the salesmen on this basis. The fact that these must vary with each product and each customer and with the characteristic of each territory has led to more refined measurements of salesmen's activities. Wide variations are to be found in miles traveled, calls made, and time spent in travel, selling, making reports and other duties. Based on averages and ratios pertaining to different conditions, physical standards of performance may be devised.

Selling Methods—The salesman must make good at his job in less than half of his time, specifically the period of direct contact with customers. Within this crucial time, the use of effective selling methods determines the salesman's performance.

This method of measuring performance has not yet been extensively employed, although many opportunities for improving the effectiveness of entire sales staffs await its use. The main deterrent probably is the careful analysis necessary to establish the effective selling methods and the subsequent time required in observing salesmen.

Net Selling Profit—The methods already described emphasize different phases of performance, such as sales volume, physical activities and methods of selling. All of these, however, are different sides of the problem of earning a profit for the company in each salesman's territory. Sales performance consists not only of selling quantities of goods but of earning profits in so doing.

The development and use of profit standards can be very helpful both in evaluating and improving performance. Considerable progress towards this goal has been made through analyzing distribution costs and profits and combining the results with those arising from studies of potentials, effort, and selling methods. Profit standards harmonize the aims of the salesmen with those of the company as a whole. In contrast, the overstressing of volume or physical effort or selling methods or some other elements of sales performance may adversely affect selling expenses and other phases of that performance.

Donald R. G. Cowan, Donald R. G. Cowan and Associates, before Chemical Market Research Association and Commercial Chemical Development Association, Philadelphia, Oct. 19, 1949.

MARKET RESEARCH

. . . *Distribution Methods*

Arthur B. Dougall

Analysis of distribution methods is merely a phrase until its full meaning is explored. In order to do an intelligent analysis and evaluation, the answers to a number of basic questions are needed, such as: What types of outlets are now being used? To what extent are these outlets providing the necessary coverage? What other type of distribution is available and at what cost? What distribution methods and policies are used by competitors? How successful are they? How well do the present sales territories allow proper coverage in relation to the market potentials?

Depending on the particular product, there are many other questions covering warehousing, branch management, plant location and so forth.

TOLL

"More than 5% of all cereal foods is destroyed in storage by insects. The millions of tons lost each year are roughly equivalent to the volume of grains in international trade."

L. W. Bass, *Vice President*
U. S. Industrial Chemicals

Furthermore, in order to analyze a distribution structure thoroughly, a measurement of sales potential is required, showing the total market, area by area, and the company's present share in each market.

Such an analysis, objectively handled and well integrated, assists sales management in decisions as to the potential of various markets, the delineation of market areas, the location and choice of distributors, the size, organization and control of the sales force, as well as a number of other equally important points.

Distribution analysis is of importance to management in other phases of the business. Production management uses this material in decisions on production capacity requirements, the need for additional plants or changes in package size or design, for example. The advertising division is aided in the allocation of their advertising budget according to territories, in selection of media and in deciding on the kinds of point of purchasing material most effective for a particular type of distributor. Furthermore, general administrative management is assisted in developing budgetary controls and in determining price policies.

The market research director of a company is so important that he should be responsible directly to top management without any operating department ties. Under such an arrangement he can usually function best by devoting his time to determining what problems need research and seeing that the results of research studies are being applied. He can then throw the weight of carrying out the studies to outside agencies rather than having to act himself as project director on each particular job.

In companies having no marketing research department, it has sometimes been suggested that the sales force be sent out with questionnaires. Types of outlets could be classified right in the company's own office, sales records examined and all the necessary work done by their own office personnel. Unfortunately, the apparent economies of self analysis have too often turned out to be just the opposite. A salesman should not be expected suddenly to turn himself in an impartial, objective and thoroughly trained field

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investigator. Nor should a busy sales office staff with its load of paper work be asked to drop their own assignments and take on the burdens of tabulation, computation, statistical typing, and so forth.

Above all, a project director is needed who is trained in research and sampling techniques, whose judgment is based on long experience with similar problems and who can devote full time to the planning, supervision and over-all analysis. In addition to these qualifications the research director must have the perspective to provide an objective interpretation of all of the findings.

It has often happened that what appeared to management to be the basic problem was merely a side issue or an offshoot of something far more fundamental.

An outside marketing research agency can bring the outsider's objective point of view. They can recommend a practical, well-balanced program of action without fear of treading on a company tradition or long-established routine.

Because of its very nature the independent marketing firm is exposed to a constant barrage of new problems and new situations concerning many types of products. Consequently, the outside agency is able to bring a wealth of experience to the market research men within the company who usually have to give their entire time to that company's problems and products.

Arthur B. Dougall, Stewart, Dougall & Associates, before Commercial Chemical Development Association and Chemical Market Research Association, Philadelphia, Oct. 19, 1949.

MANAGEMENT

. . . *Hurricane Locator*

R. C. Jorgensen & F. W. Gerdes

With the spread of the chemical industry along the Gulf Coast from the Atlantic to the Rio Grande hurricanes become of ever increasing importance to the industry.

From 1940 to 1948 the Texas Division of the Dow Chemical Co. was shut down four times due to hurricanes or fear of hurricanes that were in this area. These shut-downs caused a total of 15 days lost production as well as expensive evacuation costs to both the company and employees. When the losses in time and money are added to the mental anguish of employees who must leave their homes to be destroyed or damaged by the wrath of hurricanes while they them-

AND THE CONSUMER PAYS

"It costs the consumer more to have products sold to him than it does to produce them. In many cases it costs ten times as much to distribute a product as it does to make it."

JAMES F. LINCOLN, *President*
The Lincoln Electric Co.

selves go inland for safety, it can plainly be seen that the hurricane problem is a serious one.

Since only two of the four storms hit this area, at least half of the above loss in production and evacuation costs might have been eliminated if the exact location and course of the storms were known at all times.

A cooperative hurricane location program was worked out with the U. S. Weather Bureau in which Dow would furnish and man radar equipment, and the bureau would supply the necessary technical assistance. All data obtained would be forwarded exclusively to the bureau for their analysis and distribution.

The radar hurricane program for 1948 cost less than was expected, picked up targets at longer range than was hoped for and proved itself to be accurate and dependable for rain detection. It is expected to be just as accurate and dependable in the detection and tracking of tropical hurricanes.

A radar hurricane locator was placed in operation on June 15, 1948. The radar selected was a 10 cm. 250 kw. peak power war surplus model, which was successfully made suitable for hurricane detection purposes by extending the effective maximum range from 40 to 200 mi.

No hurricane passed within the standard range of 200 mi. during the 1948 season, however, the unit has proved itself very dependable and accurate in the detection and tracking of rain storms and weather fronts out to a distance of 200 mi. One rain storm was detected at a distance of 300 mi. while experimenting on a longer range modification. In view of the highly successful results obtained with weather fronts it is believed that this unit can be depended upon to detect and track hurricanes at a distance of 200 mi. and possibly even greater distances depending on the maximum height of the storm.

The Dow Radar transmitts for 1.6 microseconds and then becomes a receiver for the next 5,320 microseconds to receive the return echo of reflected energy. This procedure is repeated 188 times per second. The return echo or reflected energy is received by the radar and presented on

(Continued)

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QED, cont. . .

an oscilloscope screen which is in the form of a polar map with the radar unit located at its center and the distance to the target indicated by concentric range circles on the scope.

R. C. Jorgensen and F. W. Gerdes, Dow Chemical Co., before South Texas Section, AIChE, Galveston, Oct. 21, 1949.

SMALL BUSINESS

. . . *Production Management*

Frank K. Shallenberger

About 70 percent of manufacturing enterprises are independent firms of less than 50 employees. These plants have the advantages of being flexible, intimate, and informal in their worker relationships, having high worker morale and relative simplicity of management problems. Most small operators, however, wage a constant and difficult competitive battle, hampered by lack of working capital, inadequate machinery, and worst of all, limited management vision and control. Far too little attention has been paid to the problems of production management in the small plant.

Production control is a relatively simple operation involving planning, routing, scheduling, dispatching and follow-up. For a company manufacturing a variety of products on a lot basis, the most important problem is that of insuring a balanced and coordinated flow of materials up to the scheduled delivery date. A simple plan, perhaps only a blackboard, should include breakdowns of lead times showing for each part when engineering, purchase orders, patterns, tooling and materials should be released and when each operation must be scheduled to guarantee a unified flow of component parts and promised delivery.

Stores control can be a simple automatic process. It is mainly a compromise between keeping enough of the right kind of stock on hand and keeping inventory to a minimum. Few small companies can justify a full-time stores clerk with the required qualifications, but the function can be readily combined with purchasing, tools control, receiving, shipping or production con-

SURPRISE!

"All of us will be surprised at what the future turns up in the way of uranium and thorium supplies."

JOHN R. DUNNING
Columbia University

trol. Requisitioning is the accepted means of releasing stores into production, but low value standard products should be released in bulk lots to be used as needed.

Quality control is too often done by guess-work. It should be remembered that it is more important to make the part right in the first place than to discover the defect in it once a lot of labor has been wasted on it.

Cost control is a typical omission in the small plant. They frequently know nothing of their costs. Many small companies employ an accountant to prepare records for payroll and other purposes. Working with the superintendent, the accountant should be able to develop a suitable cost control procedure built on data already available. A considerable degree of control over costs can be realized through a judicious delegation of responsibilty to line personnel. The foreman, for instance, could be responsible for controlling his departmental costs. He might also be assigned part-time responsibility for controlling the use of services such as telephone, heat, light and power. In this way, line personnel can be given a part to play in the cost control program and develop a cost consciousness which should spread to their line duties.

Production management should be continually on the watch for ways of improving tooling, plant layout, performance standards, and production methods. Materials handling is particularly important—it adds no value to the product, but substantially increases its cost.

To a large extent the responsibility for carrying out these functions must be borne by regular line personnel. Management consultants, while expensive, can often help in pointing up the sources of inefficiency, but they are generally not organized to assist small business. Suppliers, customers, banks, and various governmental agencies are often equipped to help with technical advice. Technical societies and their publications often will furnish an opportunity to discuss problems with others. Unions, too, have often in the past helped management with cost-cutting and efficiency schemes. There is a vast potential source here, particularly of methods improvement, which is as yet virtually untapped.

Educational institutions have an opportunity and an obligation to contribute toward improved management in small business. Since the war, many schools of management have come to realize their social obligations to the small concern. Material on small business has been

(Continued)

It's ECONOMICAL—From Providence to Palo Alto—from Baton Rouge to Ann Arbor—the cheers and groans of rabid football fans are echoing from Redwood stadium seats. Architects of more than *thirty* of the nation's greatest stadia, including the Cotton Bowl, shown here, have specified Redwood for stadium seating. And with good reason—durable, fire-resistant, non-splintering Redwood means *low initial cost—and* freedom from maintenance headaches.

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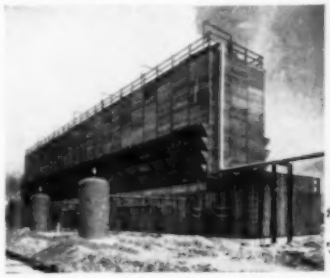

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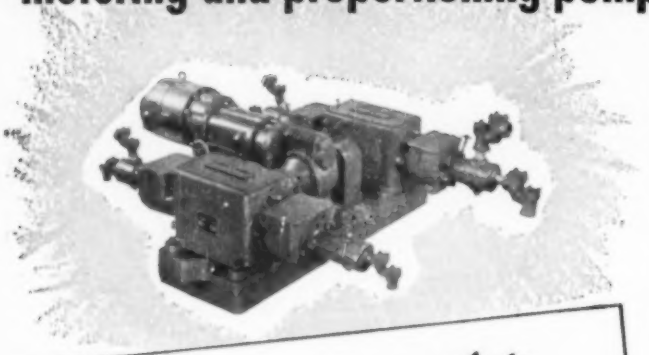

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QED, *cont. . .*

added to existing courses and new courses have been developed. There should be schools offering management training to men already engaged in small business. Such a program should be much shorter, but similar to the programs now in effect for larger concerns.

A final approach to the small businessman's problem lies in employing a single individual trained in all these functions—a sort of manufacturing controller. This is not for the plant of two or three employees, but for the concern of 25 or 30 or more. This individual could assume responsibility for organizing and administering all the necessary controls. He could provide the organization backup for the owner-manager and substitute for him when necessary.

This would be a management position, the prime requisite being a broad practical training in the administration and control of manufacturing. Actual plant experience would be of great value. The most logical candidate for this position is the man who has majored in production management at an accredited school of business administration, particularly a graduate school. Most of the current graduates of these schools are ex-G.I.'s whose age and military experience have developed a mature, practical judgment not ordinarily found in younger men. Many small companies would derive benefits far outweighing the cost of adding such a man to their staffs.

The prospect for small businessmen in the future for the most part will be that of tough competition. Whatever the situation of the company, a thorough, objective self-analysis and adoption of appropriate control techniques will improve the chances for success.

Frank K. Shallenberger, Stanford University, before the American Society of Mechanical Engineers, San Francisco, June 30, 1949.

PACIFIC NORTHWEST

. . . *A Columbia Valley Administration*

Julius A. Krug

The Columbia River Basin contains 40 percent of the nation's potential hydroelectric generating capacity, but is less than 10 percent developed for power. The people suffered the loss of 51 lives and more than 100 million dollars in property damage when the Columbia went on the rampage last summer, and they know such a disastrous flood may well occur again. A

IN LIMBO

"We have neither prosperity or depression in America nor peace or war in the world."

WALTER REUTHER,
UAW-CIO President

500 mi. navigation channel is yet to be built being only 25 percent usable today. Increase in population during the war has resulted in very high unemployment figures today. In short, the Pacific Northwest, although rich in resources, has not yet begun to be developed, nor kept pace with the needs of its people.

The development of this territory is recognized to be, in large part, a federal function, since 53 percent of the land is under federal administration. To succeed in this undertaking, the most modern management methods and techniques must be applied. However, at this time there are at least a score of federal agencies operating in the region, each of which is responsible to different executives, and each of which continually overlap, duplicate and compete with the functions of the others, resulting in great waste of talent and money.

For this reason, I advocate the passage of the bills now pending, creating a unified Columbia Valley Administration which will coordinate the activities of the federal agencies acting in the area and organize them as efficiently and democratically as possible.

At present, an agreement has been reached between the Army and the Department of the Interior as to the present administration of the area, but it must be emphasized that this is a temporary measure at best, and gives no assurance that there will not be further duplication and competition in the future.

Under the proposed bill, the CVA will take over complete responsibility for design, engineering, construction and operation of the major river-development works, irrigation facilities, and the power transmission network. There are many strong home-rule provisions which include stipulation that headquarters be located in the area, and that two of the three directors be local residents. As a result of the plan, the Department of the Interior will lose control of one of its major bureaus; however, the transfer of the authority from Washington to a regionally minded Columbia Valley Administration would provide the best possible federal machinery to go ahead with development of the Pacific Northwest.

Julius A. Krug, Secretary of the Interior, before the Public Works Committee of the House of Representatives, June 22, 1949.

—END

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FOREIGN LITERATURE ABSTRACTS

Flotation Dispersion Systems

In dispersion of air in coarse aqueous suspensions of coal, mineralized foams of two basic types can be formed: film-structural and aggregate. Aggregate foams are easily formed in the presence of an emulsion of air and hydrocarbons, or as a result of a rupture in the thin structure of the film foams, or as a result of the processes of flocculation and breaking up of the foams which are ordinarily of the film type before dispersion. The type of foam can be determined by the content of water in the products of its decomposition and by the character of this decomposition. The reduced content of water in aggregate foams is determined chiefly by the character of packing of the aggregates, and the increased content of water in the film-structural foam is determined by the considerable immobilization of water in the films and their insufficient mineralization. In aggregate foams the water content for a given gramulometric composition of coal changes within a small range, 40-46 percent, and does not depend on the quantity of flotation agent added to the pulp. The flotation activity of hydrocarbons is determined by the active spreading agent along the surface of the particles and its molecular or gravimetric relationship to the hydrocarbon. The physical state of the air bubble in a dispersion system must be regarded as the state of a system which contains a bubble, an absorption layer, and a solvate film surrounding it.

Digest from "Formation and Properties of Flotation Dispersion Systems" by N. A. Alelnikov, *Zhurnal Prikladnoi Khimii* XXII, No. 8, p. 812-822, 1949. (Published in Russia.)

Prevention of Pipe Corrosion

Cathode protection of underground pipes has developed successfully in the last 15 years and is now considered to be the most effective and economical of all applicable methods. The surface of such pipes is divided into anode and cathode portions due to such factors as the non-uniform construction of the pipe surface, the different nature of the soils penetrated

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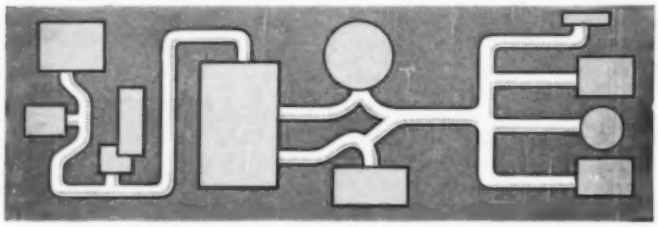

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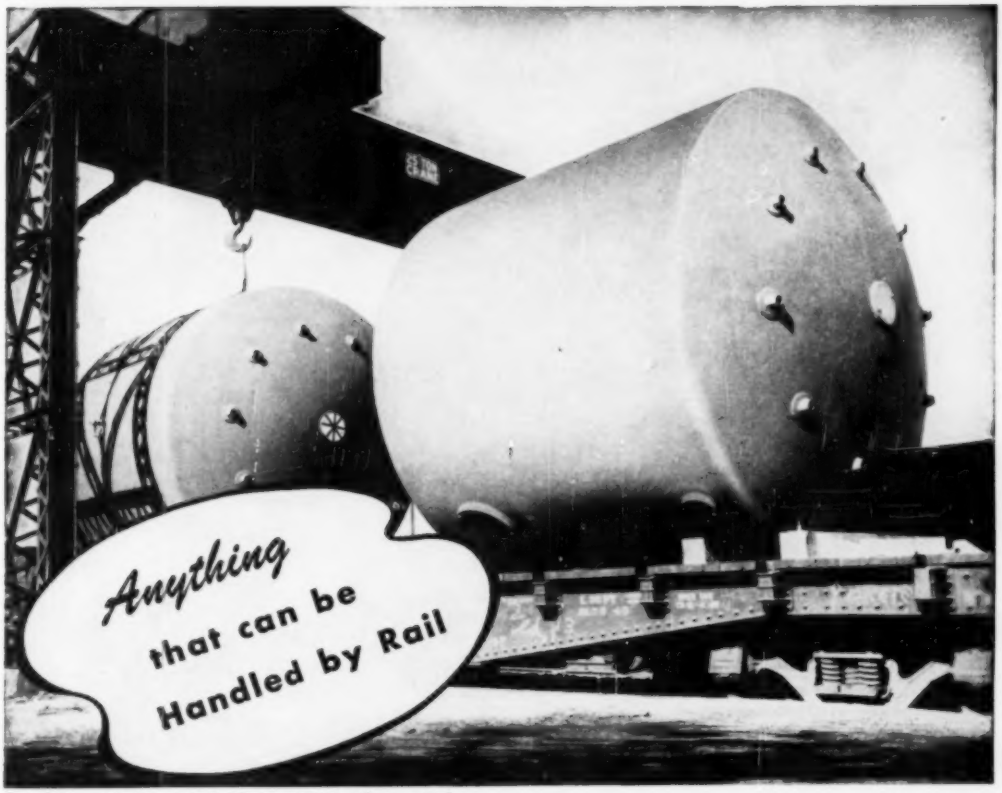

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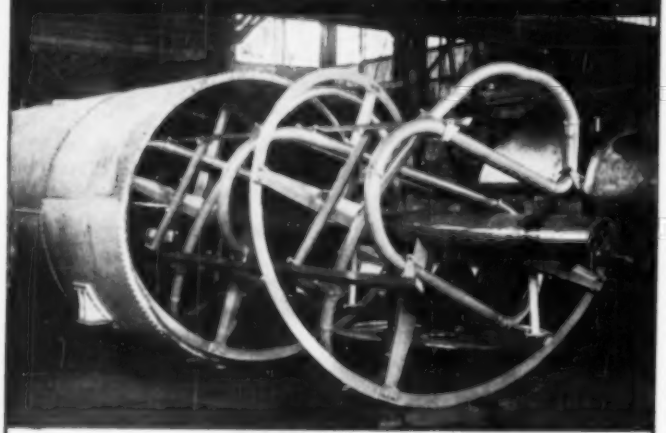

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Foreign Abstracts, cont. . .

by the pipes, effect of differential aeration, action of erratic currents, depolarizing action of biological factors. The anode portions are the points of breakdown, and the rate of breakdown is determined by the quantity of electricity passing between the anodes and the cathodes in this multi-electrode system. Destruction of the metallic surface can be inhibited by a sharp reduction in internal resistance, which is attained by the application of protective coatings with high dielectric properties, or by artificially equalizing the potential of the anode and cathode portions, which is accomplished by the method of cathode protection. The main problem is the selection of suitable boundaries for the protecting potential of the cathode-protected gas line, the economy and efficiency of the method depending on the right choice. Most investigators agree that the minimum negative potential supplied from an outside source which will assure a 95-99 percent decrease in corrosion is 0.28-0.30 v.

Digest from "Potential of Corroding Iron Construction and Protective Potential under Conditions of Cathode Protection" by I. N. Frantsevich and T. F. Frantsevich-Zabludovskaya, *Zhurnal Prikladnoi Khimii* **XXII**, No. 8, p. 793-800 1949. (Published in Russia.)

Briefs . . .

Gas Centrifuges. A 4-p. abetract appearing in *Chemie-Ingenieur-Technik* is from a report which is to appear as Supplement No. 59 of *Angewandte Chemie* and *Chemie-Ingenieur-Technik*. It is on the concentration of xenon, krypton and selenium isotopes by the centrifugal process and will be some 72 pages long, with 29 illustrations. It will deal with the theoretical principles, construction of apparatus and some experimental results of the separation process with a gas centrifuge constructed by the authors.

Digest from "Gas Centrifuges (Abstract). Concentration of Xenon, Krypton and Selenium Isotopes by the Centrifugal Process" by K. Beyerle, W. Groth, P. Harteck and H. J. D. Jensen. *Chemie-Ingenieur-Technik* **21**, No. 17-18, 331-334, 1949. (Published in Germany.)

German Synthetic Material Industry. Having been interrupted by the war, this industry must now be reestablished. This article discusses the problems faced in different parts of the country in the production of such materials as synthetic resins, lacquer resins, polymerization products.

Digest from "Problems and Tasks of the German Synthetic Material Industry" by Richard Blankenfeld, *Chemische Industrie* **1**, No. 1, 20-22, 1949. (Published in Germany.)

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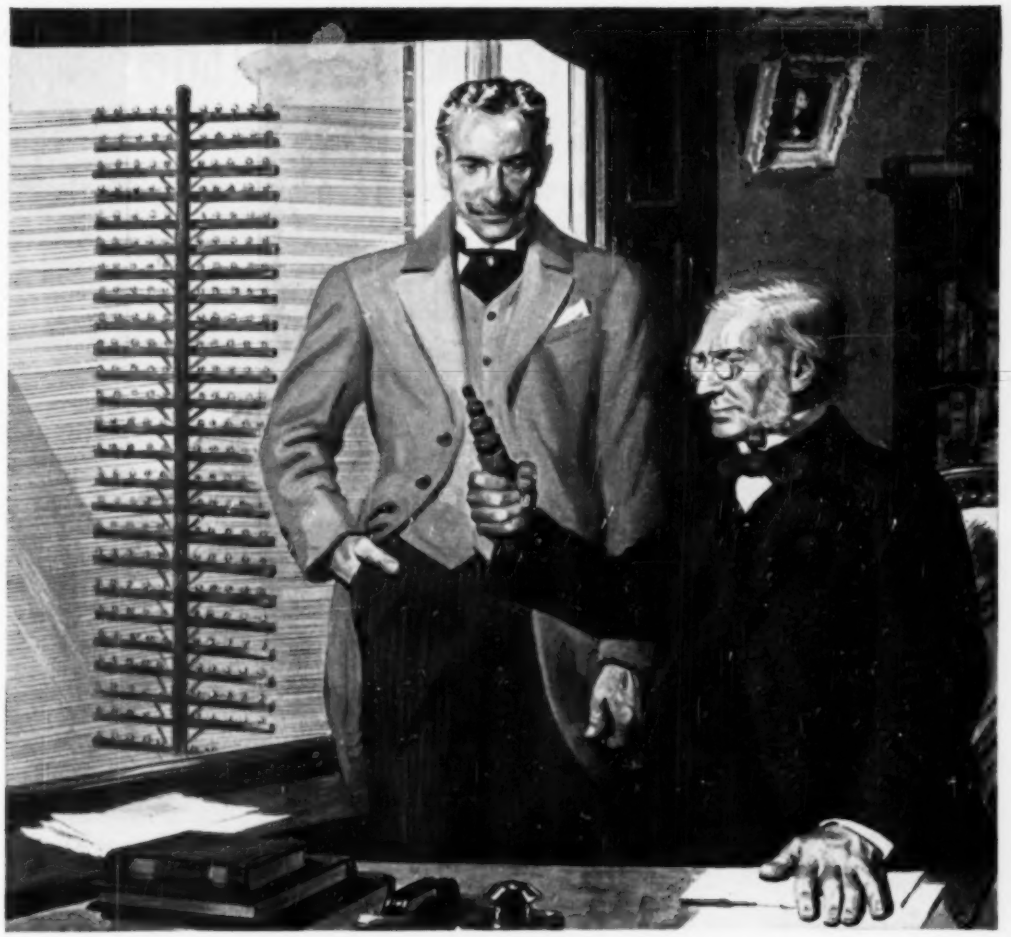

They Packed a Pole Line Into a Pipe

Back in the eighties, telephone executives faced a dilemma. The public demanded more telephone service. But too often, overloaded telephone poles just couldn't carry the extra wires needed, and in cities there was no room for extra poles. Could wires be packed away in cables underground?

Yes, but in those days wires in cables were only fair conductors of voice vibrations, good only for very short distances. Gradually cables were improved; soon every city call could travel underground; by the early 1900's even cities far apart could be linked by cable.

Then Bell scientists went on to devise ways to get more service out of the wires. They evolved carrier systems which transmit 3, 12, or even 15 voices over a pair of long distance wires. A coaxial cable can carry 1800 conversations or six television pictures. This is another product of the centralized research that means still better service for you in the future.

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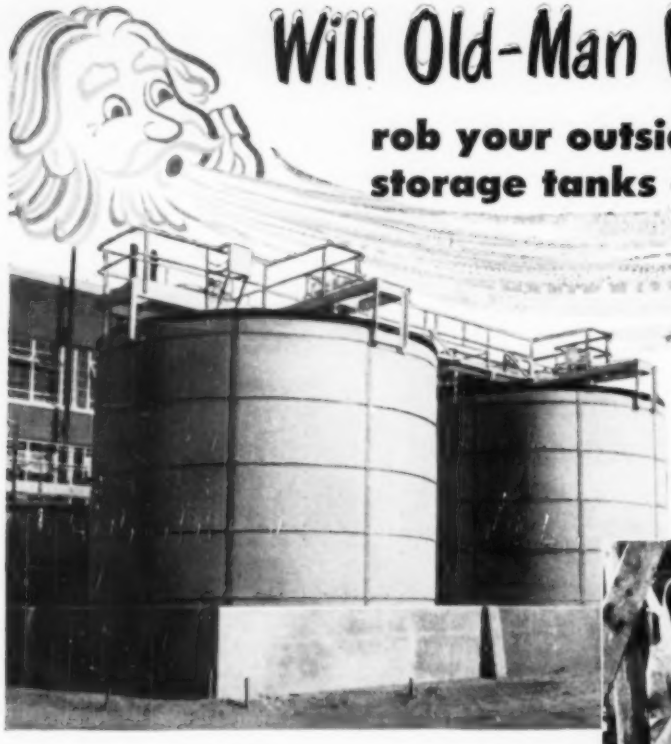

Left: These neat-appearing, insulated tanks are weather-protected by the Johns-Manville specification described here.

Below: Applying J-M Asbestocite (asbestos and cement sheets that are weather- and corrosion-resistant) over standard J-M Insulations.

. . . Here's how Johns-Manville can help you save fuel costs . . . maintain temperatures of externally stored fuels and chemicals . . .

IF YOU HAVE OUTDOOR tanks and vessels... and are heating or cooling them it will pay you to look into the Johns-Manville Weather-Protected Insulation specification.

Weather-Protected Insulation pays even though outdoor storage tanks are operated at moderate temperatures—because wind and other weather conditions can greatly affect tank temperatures. Savings, for example, on a standard fuel storage tank operating at 130 F maintained temperature can be as much as 200 Btu/sq. ft./hr.

Basically, this Johns-Manville Weather-Protected Insulation specification consists of standard J-M insulations over which is applied Johns-Manville Asbestocite (asbestos-cement sheet) to protect the insulation from the weather. Shielded in this manner, the insulation pays dividends in fuel savings for many years.

If you wish, a Johns-Manville Insulation Engineer will be glad to survey your outdoor equipment to estimate fuel savings for you. Or, for more details send for a copy of folder IN-121A. Johns-Manville, Box 290, New York 16, New York.

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Chemical Engineer's Bookshelf

LESTER B. POPE, Associate Editor

New Equipment, Products and Techniques

CHEMICAL ENGINEERING PLANT DESIGN. Third edition. By Frank C. Vilbrandt. McGraw-Hill Book Co., New York. 608 pages. $6.

In the opinion of his contemporaries, Frank C. Vilbrandt is a substantial citizen; a serious-minded chemical engineer who is particularly interested in pilot-plant studies. This opinion and the appearance of the third edition of a well-known text both belie the author's claim to laziness.

"Chemical Engineering Plant Design" had its origin at Iowa State College. The book—so the author says—was invented to help a lazy man. It became apparent, he claims, that the weight of mimeographed material, technical literature and reference books was too much to carry back and forth across the open campus to classroom and laboratory. Hard driving snow, heavy dust storms, cyclone-driven rains and plain bleak winds were the hazards. It was decided that the essential material could be compressed into a manuscript that would involve less slipping, falling, collecting, picking up, and cleaning.

On such is the author's claim to laziness based. But let's look further. For a writing room for the first edition he used a section of his cellar and excluded mother, wife and children. During the first revision, a guest room for nine months was the private sanctum. For the third edition, a confiscated hall with shelves and a homemade desk claimed author Vilbrandt from 7 to 11:30 P.M. six nights a week for six months. Thus is refuted a phony claim to laziness.

No author suffering from sloth could have turned out a first edition that W. R. Veazey said "gives an excellent, practical, common-sense presentation of the problems encountered in the arrangement and construction of the chemical plant itself" (*Chem. & Met.*, Dec. 1934, p. 654). Nor could he make a second edition that, according to R. H. McCormack, "brings up to date one of the most helpful single books available for the teaching of the subject" (*Chem. & Met.*, May 1942, p. 209).

Comments by Veazey and McCormack may be applied to the third edition. It is still valuable "for the engineer concerned with the erection of chemical plants." It will still "be welcomed both by teachers and by future employers of their students."

F. C. Vilbrandt

"New material has been added"

Presenting the third edition was forced by changing pricing conditions and necessitated considerable inclusion of price indexing to all phases of plant design. This is the major difference in the editions. The third's chapter on preconstruction cost estimating has grown to 135 pages. (41 pages in the first; 61 in the second editions.)

Much of this material originated in the pages of *Chemical Engineering*. It's too bad that we couldn't give Prof. Vilbrandt the excellent article on correlated cost data by Du Pont's C. H. Chilton that appeared in *Chemical Engineering* last June. It's also too bad he couldn't get better data than 1924 and 1926 on costs of foundation, walls, flooring and a few other construction items.

These deficiencies will be corrected in the fourth edition. But "being a lazy man," Vilbrandt hopes the world situation won't force an early revision.

We won't count on that. There were eight years between editions one and two; seven between two and three. Continuing the progression: six years between the third and fourth editions. Look for it in 1955. Soon this lazybones will have to neglect his golf and gardening and his three grandchildren who are "more than a recreation, pleasure or hobby." He'll have to go back to that hallway office and turn out another revision for students and their future employers.—*LBP*

Personal Views on a Controversial Subject

THE ALCHEMISTS: FOUNDERS OF MODERN CHEMISTRY. By F. Sherwood Taylor. Henry Schuman, New York. 246 pages. $4.

Reviewed by H. C. Parmelee

It is doubtful whether the average scientist, to say nothing of the layman, has more than a sketchy idea of the alchemists and their work. A vague recollection of an age-long search for the philosopher's stone and transmutation of the elements probably comprises the ordinary man's knowledge of the subject. So we are all indebted to the present author for condensing the results of 20 years of study into one small volume containing his personal views on a highly controversial subject. That his treatment is far from exhaustive or final is indicated by the fact that he offers his opinions merely "as approximations of the truth, an interim report as it were."

As the subtitle of the book suggests, the alchemists were the founders of modern chemistry. They were interested in the constitution of matter and in the changes that could be brought about by chemical treatment. They had their alchemical signs and symbols. They were not merely theorists, but "the fathers of laboratory technique." They were experimenters who designed their own equipment, particularly for distillation (which they probably invented) for the treatment of metals with vapors. Although their goal was the transmutation of base metals into gold, they were neither magicians, wizards, nor charlatans. Their work, however, was surrounded with such secrecy, and their terminology and nomenclature were so obscure, that alchemy still remains an unsolved problem. Three ideas seemed to underlie their philosophy:

(Continued)

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(1) that any kind of matter could be transformed into any other; (2) that this transformation involved the corruption, or death, of the matter to be transformed, and the generation, or birth, of a new form; and (3) that a subtle substance, *pneuma*, (spirit) played the principal part in generating new forms.

The practice of alchemy probably began about 100 A.D. and flourished until late in the seventeenth century. Its first devotees were Egyptian and Jewish, some of them women. Later the Arabs became enthusiastic alchemists, and finally the practice spread throughout Western Europe. There is also evidence that alchemical beliefs and processes prevailed in China, although the goal there was an elixir of immortality rather than a means of transmuting other metals into gold. In separate chapters the author elaborates on the characteristics of alchemy as practiced in Egypt, China, Islam, England, and Europe. The text is enlived with alchemical recipes, formulas, stories of transmutations, and illustrations of alchemical symbolism.

Although the alchemists were the "founders of modern chemistry," it is not to be loosely assumed that at some stage of its career alchemy developed into chemistry. Practically the only part of alchemy that became part and parcel of chemistry was its laboratory technique. Otherwise the methods and purpose of alchemy were alien to the budding science of chemistry that began to emerge in the late seventeenth and early eighteenth centuries. The book is written primarily for the informed layman, but scientists generally may read it with interest and satisfaction.

First of Its Kind

QUANTITATIVE ORGANIC ANALYSIS VIA FUNCTIONAL GROUPS. By Sidney Siggia. John Wiley & Sons, New York. 152 pages. $3.

Reviewed by A. I. Gebhart

The book presents a collection of methods for the determination of about 25 organic functional groups or structural types. The need for a collection of such methods has long been apparent to those interested in quantitative organic analysis.

Some of the procedures have been developed by the author and his associates, numerous others are taken from excellent methods reported in the literature while the origin of others is not disclosed.

The format of the book is good and there are few typographical errors. Each determination is prefaced with a short general discussion, followed by a description of one or more suggested methods, after which the calculations are usually given. For some unknown reason, comments on the scope of the method, interfering substances, accuracy and the like are included in the section on calculations.

An outstanding omission is the bibliography on the subject, particularly when some of the excellent work published in recent years is considered. The author excuses this by stating that "all procedures were chosen to meet standards of general applicability." From long experience, both in re-

RECENT BOOKS RECEIVED

Acetylene and Carbon Monoxide Chemistry. By J. W. Copenhaver & M. H. Bigelow. Reinhold. $10.

Analytical Chemistry of Industrial Poisons, Hazards and Solvents. 2nd ed. By M. B. Jacobs. Interscience. $12.

Antibiotics. By G. W. Irving & H. T. Herrick. Chemical. $6.75.

Boron Trifluoride and Its Derivatives. By H. S. Booth & D. R. Martin. Wiley. $5.

Chemistry of Plastics & High Polymers. By P. D. Ritchie. Interscience. $4.50.

Colloid Science—II. By H. R. Kruyt. Elsevier. $11.50.

Colorimetric Methods of Analysis, Vol. II. 3rd ed. By F. D. Snell & C. T. Snell. Van Nostrand. $12.

Encyclopedia of Chemical Technology, Vol. IV. Ed. by R. E. Kirk & D. F. Othmer. Interscience. $20.

Fluorescence and Phosphorescence. By P. Pringsheim. Interscience. $15.

Fundamentals of Synthetic Polymer Technology. By Houwink. Elsevier. $3.75.

Industrial Chemistry. 5th ed. By E. R. Riegel. Reinhold. $7.

Introduction to Semimicro Qualitative Analysis. By C. H. Sorum. Prentice Hall. $2.75.

Laboratory Fractional Distillation. By Thomas P. Carney. Macmillan. $5.75.

Mathematics Dictionary. By Glenn James & R. C. James. Van Nostrand. $7.50.

Metals Reference Book. By C. J. Smithells. Interscience. $13.50.

Methods of Joining Pipe. By J. E. York. Industrial Press. $3.

Petroleum Technology in 1946. By F. H. Garner, E. B. Evans & G. Sell. Institute of Petroleum. 27s,6d.

Progress in Metal Physics, Vol. I. By Bruce Chalmers. Interscience. $9.50.

Radiant Heating. 2nd ed. By T. N. Adlam. Industrial Press. $6.

Science and Civilization. By R. C. Stauffer. University of Wisconsin. $2.50.

Synthetic Methods of Organic Chemistry, Vol. II. By W. Theilheimer. Interscience. $7.50.

Technology of Light Metals. By A. von Zeerleder. Elsevier. $6.

Third Symposium on Combustion and Flame and Explosion Phenomena. Williams & Wilkins. $13.50.

search and teaching, it is this reviewer's observation that there is no such thing as "general applicability" in the analysis of functional groups and no one method will always suffice.

It seems regrettable that the use of semi-micro techniques (25-50 mg.) has not been given more emphasis. Many of the methods are lacking in description of minor, but important details which will necessitate reference to the original paper. In other cases, while the method given is satisfactory for the compounds determined by the author, it would fail for those of higher molecular weight, for example, the estimation of oxirane oxygen. The brief discussion of sulphonic acids, in view of their rapidly increasing importance as surface-active agents, is difficult to understand.

In two final sections an attempt has been made to discuss the separation of mixtures, electrodialysis, electrophoresis, chromatography and spectral methods in 20 pages. The purpose of the book would have been better served had these been replaced with other useful determinations which are missing.

While the book is sketchy, and there are numerous omissions, it is nevertheless the first work of its kind. If used with this in mind, it is a contribution to the rapidly developing field of organic analysis and is recommended to those concerned with work of this nature.

Petrochemical

THE PETROLEUM CHEMICALS INDUSTRY. By Richard F. Goldstein. E. and F. N. Spon, Ltd., 22 Henrietta St., London, W.C. 2. 449 pages. 63s.

Reviewed by Kenneth A. Kobe

It is ironical that a British author would be the first to give an adequate account of the petrochemical industry, so much of which originated in the United States. The author, a research chemist of the Imperial Chemical Industries, Ltd., apparently was requested to survey the field to see how ICI might fit into the petrochemical industry which did not begin until recently when Great Britian removed the import duties from hydrocarbon oils used for chemical synthesis. Dr. Goldstein has done an outstanding job of surveying the field and presenting it in concise, orderly and interesting manner. Most of the manuscript was written in 1946 but additions were made to make the subjects complete to the end of 1947 and references as late as August 1948 are found.

The first chapter discusses the composition of petroleum and the separation made at the refinery. The phy-

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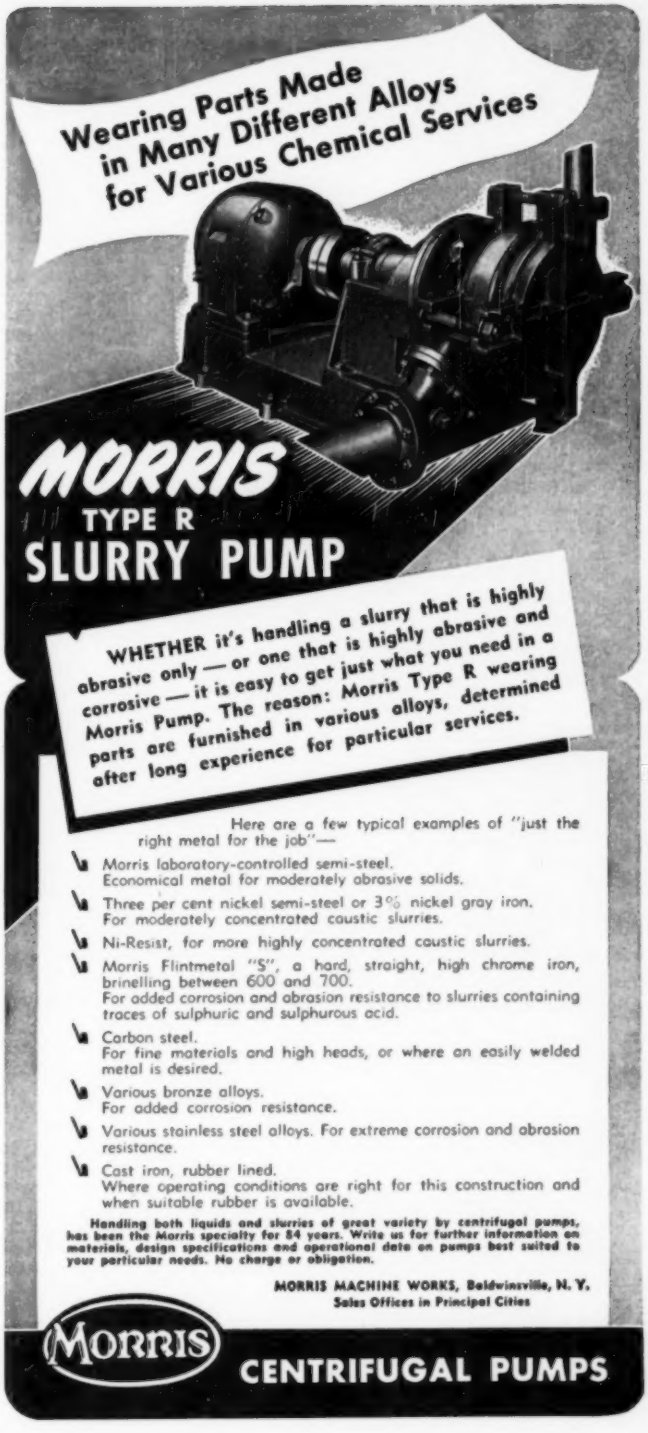
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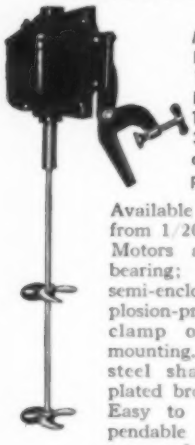

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sical chemistry is not spared, for along with tables of hydrocarbons is found a discussion of relative volatility, K-values, azeotropes, entrainers and extractive distillation. Throughout the book reference is frequently made to these methods, as in the separation of butadiene by extractive distillation with furfural. Chapter 2 deals with the production of synthesis gas and its use for methanol and the Fischer-Tropsch synthesis. Chapters 3, 4 and 5 are concerned with the oxidation, chlorination and nitration of paraffin hydrocarbons. The following section, Chapters 6 to 10, discusses the olefins, their manufacture, hydration, oxidation, reactions with halogens and miscellaneous reactions. This is followed by four chapters on the production of diolefins, naphthenes, aromatics, and acetylene. These compounds are considered as the end products and their reactions are not discussed. Chapters 15 to 19 give the principal classes of oxygen and nitrogen compounds, the processes for manufacturing and reactions of aldehydes, acids and derivatives, oxides, nitrides and amines. The final chapter discusses briefly non-hydrocarbon byproducts from petroleum as naphthenic acids, nitrogen bases and sulphur compounds. An appendix gives statistics up to 1945 or 1946.

It is obvious that a book of 449 pages will not contain an exhaustive discussion of any one topic mentioned above. However, the emphasis is placed on the industrially important reactions and compounds with the most stress on the chemistry of the reaction occurring. The interrelationships of various processes and products are shown on family-tree charts, a number of which fold out. Illustrations are diagrammatic and no space is wasted on plant pictures. The thermodynamics of the processes are discussed as far as possible, though unfortunately, much of the free energy data is from the Parks and Huffman book rather than the API 44 project data. Uses of the various compounds are mentioned only briefly, usually only one or two lines, leaving some doubt in the reader's mind as to what quantitative meaning should be given "very widely used." Frequent reference is made to BIOS, CIOS, and FIAT reports on German industrial practice. A criticism can be made of the abbreviated manner in which reference is made to these reports and to patents. The reference BIOS 1056 tells very little unless one has available an index to these reports. Most patent references are to British patents, even though there is a prior U. S. patent, and the reference is given as "du Pont, B.P. 575559," which would cause time to be wasted in finding the abstract of the patent. Certainly the date of issue could be given and possibly the title. Journal references are sufficiently complete, though the reader must remember that 5.9.46 is 5 September 1946.

This book is recommended as an interesting and authoritative survey of the chemical phases of the petrochemical industry.

Interesting and Novel

ELASTOMERS AND PLASTOMERS. Vol. III—Testing, Analysis and Properties. Edited by R. Houwink. Elsevier Publishing Co., New York. 174 pages. $4.50.

Reviewed by Walter Brenner

This book is the last in a series of three volumes on the chemistry, physics, and technology of high polymers under the editorship of R. Houwink, external lecturer in the Technical University at Delft, Netherlands. The volume consists of five chapters, the contents of which have been written by a number of specialists in their respective fields, all but one of whom are active in high polymer work in Western Europe. Because of this the book has an interesting and often novel approach to a number of the topics discussed when compared to a number of American publications on this subject. One of the greatest needs in the field of high polymers is the development of adequate testing methods and standards for both raw materials and finished products. A volume of this nature, therefore, which brings together such information which is quite widely scattered in the literature and not always easily accessible to the average worker, fulfills a definite need in the high polymer field.

The various topics discussed include the testing methods employed for plastic materials, the chemical analysis of high polymers, and the properties of elastomers and plastomers etc. presented in tabular form. Chapter II by Dr. J. H. Teeple of the Celanese Corp. of America, on "methods of testing" is to be commended specially because of the lucidity of exposition of a subject which is indeed of prime importance in the industries affected today. The need for adequate standards not of a static but of a dynamic nature, throughout the various countries engaged in the production of plastics and rubbers is stressed rightfully throughout the book. The lack of cooperation existing between the different parts of the world becomes obvious and is indeed repeatedly mentioned throughout the discussion. The limitations and advantages of chemical

analysis are carefully presented although this section could have been somewhat expanded to include raw material sampling, etc. The tables on the properties of the various materials are quite complete and are easy to read. Copious references are given at the end of each chapter for further study of anyone of the topics discussed.

This book can be recommended to those interested in the development of adequate testing methods and standards for plastic and rubber products and students studying this subject. The tables on the various properties of these materials should be useful in the reference library of all chemists and chemical engineers coming in contact with rubber or plastic products.

For the Initiated

ORGANIC COATINGS IN THEORY AND PRACTICE. By A. V. Blom. Elsevier Publishing Co., New York. 298 pages. $6.

Reviewed by C. F. Silleck

This volume is number six in the Elsevier Polymer Series. The author's preface states the purpose of the book is "to define the actual position of our knowledge of coating materials in broad outline and to try to depict the doctrine leading to further investigations." Further, it was the intent to outline the principal facts and theories of current organic coating science. The documentation is based on Dr. Blom's own research and no completeness in selection of topics is claimed.

The book is organized under seven main sections. In the first, the fundamental ideas of film formation are presented. At the outset, the keynote of the entire volume is struck, namely, that the scientific progress of the coating industry is dependent upon an understanding, not of chemical concepts alone, but of these concepts as they are related to colloid science and the physics of macromolecular substances.

Sections II and III discuss natural and synthetic film forming materials respectively. These receive rather sketchy treatment; although well supplemented by references, the worker in any one field may feel that certain authorities have been overlooked. At random, this reviewer missed the names of Gardner and co-workers on shellac; Koebner, Megson, the latter's co-workers and others who earlier contributed so much to the elucidation of phenolic resin structure; Goldschmidt, Einhorn, Hamburger, Dixon and Walter on urea and sulphonamid resins; Honel on Alkyds. Such omissions are not serious as they are to be found in one or more of the 16 publications

(Continued)

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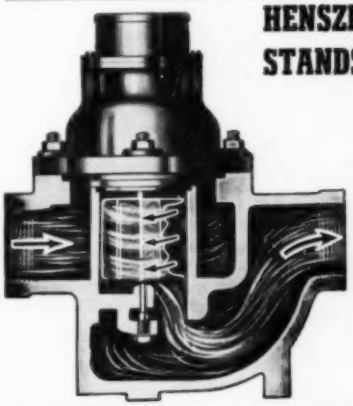

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cited in the selected bibliography constituting part of the appendix.

Sections IV and V are devoted to physical and chemical film formation. The former discusses the formation of films from non-convertible substances by evaporation of solvent and by hot-melt and flame-spray coating techniques. Chemical film formation refers to films resulting from element and heat convertible filmogens. Dr. Blom has much to contribute in delineating his concepts on this subject. It would be invaluable if these views could be more widely circulated among protective coating technologists.

Section VI is a nicely balanced discussion of pigments, tracing the effect of particle size and shape on dispersion properties and, eventually, the bearing of pigment-vehicle relationships on film behavior.

Section VII is concerned with film properties and their evaluation. Perhaps the best way to characterize this section is as an indispensable background for test methods more specifically described elsewhere; for example, in Mattiello's "Protective and Decorative Coatings," Vol. V, and the well known "Physical and Chemical Examination of Paints, Varnishes, Lacquers and Colors." It would aid in interpreting and highlighting test results and assist greatly in the general usage of any testing manual in the coating industry.

This book is well constructed as to binding and printing. References are given at the foot of the pertinent page. Of value is the system used for identifying chapters and subdivisions thereof, thus facilitating the location of subject matter.

This is an authoritative work. The scope of the subjects treated is so broad that the specialist in any particular phase of the coating industry may find his own sphere of activity presented rather superficially. However, this treatise is not for the uninitiated in the field. Its value is greatly enhanced by acquaintance with the writings of Staudinger, Mark, Carothers, Kienle, Flory and Houwink. Dr. Blom's book belongs in the library of everyone concerned with high polymeric substances.

Planning and Control

PLANT PRODUCTION CONTROL. SECOND EDITION. By Charles A. Koepke, John Wiley & Sons, New York. 568 pages. $5.50.

It is possible that chemical engineering management would find the second half of this book of value. It deals with subjects such as plant capacity, maintenance, coordinating sales and manufacturing, production planning, inventory control and other plant problems. Like the first half, however, it is slanted toward manufacturing problems in the metal working industries.—*LBP*

"So What?"

INTRODUCTION TO STATISTICAL MECHANICS. By Ronald W. Gurney. McGraw-Hill Book Co., New York. 268 pages. $5.

Reviewed by Hugh M. Smallwood

Professor Gurney introduces his book as follows: "Among students of physics and chemistry there seems to be a widespread belief that statistical mechanics is necessarily a difficult and abstruse subject that cannot be presented in a form attractive to the experimentalist. In recent years, several of the author's friends have challenged him to write a book to show that such a point of view is mistaken."

In meeting this challenge the author devotes the first six chapters, comprising about one-half of the book, to the Maxwell-Boltzmann treatment of the equilibrium properties of gases, mixed crystals, and a few other simple systems. One chapter is devoted to the relation between statistical mechanics and thermodynamics. The discussion is made as non-mathematical as possible and attention is focused on the physical meaning of the equations. Quantum mechanical language is used throughout.

Subsequent chapters deal with somewhat more advanced topics. Solutions and especially alloys are discussed in some detail. Gibbs' method is briefly outlined as is also the classical treatment of a gas. Van der Waals' equation is developed and briefly discussed. Crystals are studied in somewhat more detail. The last two chapters are devoted to such topics as vapor pressure constants, ortho and para hydrogen, the effects of electrical and mechanical fields, Fermi-Dirac statistics and atomic nuclei.

Throughout the book, the author assumes the reader to be thoroughly grounded in physical chemistry and also to be acquainted with the terminology and concepts of quantum theory. In many places he is didactic where a more complete text would be deductive.

Very little detailed comparison with experiment is included in the book. Indeed, the only numerical comparison of theory with experimental results is given in two diagrams and three tables toward the end of the book.

In order to obtain his objective as given in the statement quoted above, the author has found it necessary to

pass rather lightly over some important assumptions. These are considered in more detail in the later part of the book, but he has not hesitated to sacrifice exhaustive discussion to the goal of emphasizing the physical content of his material.

The principal liability of this text, in the opinion of the reviewer, is that the author never gets around to answering the question, "So What?" Rather, it is left to the student to discover the importance and utility of the results obtained. Thus, four pages are devoted to Fermi-Dirac statistics but no mention is made of their application to the specific heats of metals or to liquid helium. Again, the 14-page chapter devoted to the relation between statistical mechanics and thermodynamics gives the derivation of the standard thermodynamic equations by suitable manipulation of the statistical equations previously obtained, but there is no comparison of the statistical approach with the thermodynamic method. Altogether, one is reminded of the mathematician who concluded a lengthy discussion before his class with the remark, "And now, gentlemen, since we see that the problem possesses a solution, we lose all further interest in it."

It is important to present statistical mechanics with emphasis on the positive contributions rather than on the difficulties of the past. Professor Gurney has succeeded in accomplishing this, but it is hardly to be expected that his book will suffice in itself to give the reader a thorough mastery of the subject. After all, the author has only attempted to introduce the subject to those who are already familiar with thermodynamics and with general physical chemistry. Such a reader will find many stimulating paragraphs in this text. The problem given at the end of each chapter will afford useful exercises. To this extent, Professor Gurney is to be congratulated. It is to be doubted, however, that many students will be satisfied to use his book for any object other than obtaining a general familiarity with the methods of statistical mechanics.

Pills

TABLET MAKING. By Arthur Little and K. A. Mitchell. Northern Publishing Co. Ltd., 37, Victoria St., Liverpool, 1 England. 121 pages. 15s.

This book contains a description of the equipment used in Britain for the wet granulation method and the double compressing or "slugging" method of preparing tablets, and a detailed discussion of the processing steps involved.

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A particularly useful chapter gives information on how to process specific formulas and forms a basis to work on when similar materials have to be compressed. An example is calomel, digitalis, and paraformaldehyde.

A representative list of formulas is included.—*MMH*

Titaniferous

TITANIUM — ITS OCCURRENCE, CHEMISTRY AND TECHNOLOGY. By Jelks Barksdale. The Ronald Press Co., New York. 591 pages. $10.

Reviewed by Robert S. Aries

The first comprehensive book on titanium to appear in the United States is well written and well timed. While titanium is already important commercially, developments of today will undoubtedly open vast new areas for this versatile metal, which is light, strong, tough and corrosion resistant. The book of Dr. Barksdale well summarizes present-day applications and should prove to be a valuable reference to the workers already in the field and the many more who should enter it in the near future.

The book is divided into 28 chapters, each one of which is profusely documented. The author delves into such topics as the occurrence, geology and mineral deposits which yield titanium; production and import of ores and the chemistry of elemental titanium.

The 20-odd chapters which deal with processes, applications and uses are well collated. They include intimate details on pigment manufacture and sketchier information on alloys, ceramics, catalysts, mordants and dyes.

The book is recommended to all workers in the fields of processing and using of titanium products and should be a useful reference for the ever increasing industrial applications of the abundant mineral.

Of Mules and Molecules

ADVANCED ORGANIC CHEMISTRY. By G. W. Wheland. John Wiley and Sons, New York. 799 pages. $8.

Reviewed by F. C. Nachod

Books are like buildings; there are brownstones and quonsets. There are mansions and skyscrapers. But sometimes there are temples and cathedrals —graceful and awe-inspiring. Dr. Wheland's book, were it a building, would belong to the last category.

The subject matter and the sequence of treatment may be indicated by the chapter headings: Fundamental concepts, addition compounds, modern concepts of acids and bases, structural isomerism, stereoisomerism, configurations of carbon compounds, stereochemistry of carbon, configuration and stereochemistry of elements other than carbon, strain theory and steric hindrance, theory of resonance, electrostatic effects in organic chemistry, molecular rearrangements, tautomerism, and free radicals.

It is perhaps misleading to call this treatise a second edition as there is no first edition in a strict sense. The subject matter had been published in two syllabi for advanced organic chemistry in 1946 and 1948 respectively, but the fusion into an integrated textbook is new.

It is easy to read Dr. Wheland's book; as a matter of fact it reads more like a novel than like a dry textbook, without however sacrificing accuracy or clarity in the presentation. Dr. Wheland's sense of humor is a wonderful asset in such an undertaking and when it comes to the treat-

(Continued)

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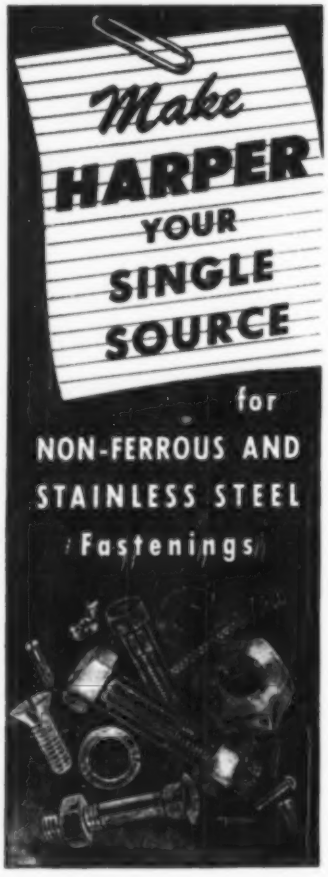

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EVERLASTING FASTENINGS

ment of resonance where he is an unchallenged authority, the reader has a specially enjoyable time. One of his parables is too good to pass by in this review, and we read on page 392:

> The statement that a mule is a hybrid between a horse and a donkey does not imply that a given mule is a horse part of the time and a donkey the rest of the time; neither does it imply that, at any given time, some mules are horses and the rest are donkeys. Instead it implies that a mule is neither a horse nor a donkey but is a single kind of animal, intermediate at all times between the two extremes; and that all the mules are the same kind of animal.

As this reviewer stated, it is a rare pleasure to come up against as fine and mature a piece of workmanship as Dr. Wheland's "Advanced Organic Chemistry." Any organic chemist, or rather without reservation, any chemist, who does not have this book on his shelf is missing an excellent bet.

The ABC's

STAINLESS STEELS. By Carl A. Zapffe. American Society for Metals, Cleveland. 368 pages. $5.

You've got to give Dr. Zapffe credit; he is easy to read. He is writing here for the non-specialist, for the man who has worked with stainless without knowing exactly why he uses it the way he does, or why stainless acts the way it does. Dr. Zapffe assumes he wants to find out; he doesn't assume much technical background. Consequently he has tried—not to duck technical principles—but to explain them simply and without all the ins and outs and technicalities that fog the broad outlines of the issue (the mechanism of passivation, for instance). The not-too-technical man should have little difficulty in the chapters on history, physical properties, mechanical properties, fabricating. A nodding acquaintance with metallurgy will probably be helpful in the chapter on corrosion resistance and the one on metallurgical constitution. There is a 34-page glossary to smooth the way.—*ECF*

Slightly Sketchy

ULTRASONICS. By Benson Carlin. McGraw-Hill Book Co., New York. 270 pages. $5.

Reviewed by Joseph Greenspan

This volume is a timely and welcome companion to Bergmann's classic on the same subject, especially since the discussion leans to the "practical and engineering sides," well known theories and works being "presented as statements of fact, without derivations and histories of development."

The book comprises a rather uneven review, being of outline brevity in some parts (Chapter VIII, Ultrasonic Agitation) while going into considerable detail in other sections (Chapter IV, Crystal Holders for Ultrasonic Use). Block diagrams of circuits are used throughout the text; details are rarely given. The bibliography is severely and perhaps justifiably limited to avoid the repetitious and re-edited references appearing in the literature.

Chapter VII on pulsed ultrasonic systems provides a useful outline of circuits employed in this relatively recent phase of ultrasonics. Together with Chapter VI on continuous-wave ultrasonic systems, they represent the high point of the text.

In view of the expressed objection to slant this book in the direction of application, it is somewhat disappointing to find the results of present applications and the future practical possibilities of ultrasonics treated in so sketchy a fashion. The subject well deserves a more thorough discussion and we trust that the author can be persuaded to expand this excellent first attempt for the next edition.

Beginning With Data

STATISTICAL METHODS IN RESEARCH AND PRODUCTION. Second edition. By Owen L. Davies. Oliver and Boyd, London. 292 pages. 28s.

Reviewed by Murray A. Geisler

This is the second edition of a book published for the first time in 1947, in conformity with the authors' stated intention that it would be kept up-to-date. It is a handbook of statistical methods for the industrial research worker prepared in terms with which he is likely to be familiar. The book, as republished, is substantially unchanged. The significant revisions or additions involve the chapter appendixes, which for the most part, contain whatever mathematical discussion is included in the book.

The range of topics covered is well indicated by the chapter headings: Frequency Distributions, Averages and Measures of Dispersion, Tests of Significance, Analysis of Variance, Regression and Correlation, Frequency Data and Contingency Tables, Sampling, Control Charts, and Prediction and Specification. In addition, there is a glossary of statistical terms, which is adequate for the technical coverage of the book, and an unusually comprehensive collection of statistical tables (area under normal curve, percentage points of χ^2, t and F, values

(Continued)

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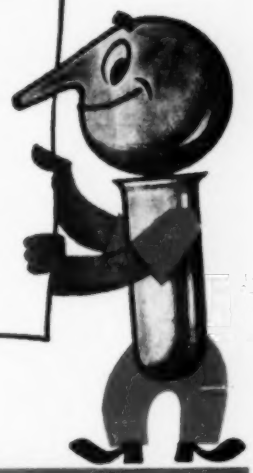

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Triisobutylene—$CH_2:C(CH_3)CH_2C(CH_3)_2CH_2C(CH_3)_3$†
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of correlation coefficient for different levels of significance, limits of the expectation for binomial and Poisson distributions, and control chart limits for average and range).

Each chapter starts with a general description of the subject which it covers, followed by interesting examples (based on data usually from the chemical industry) which illustrate the methods described in the chapter. The discussion of the examples is not obscured by arithmetical details; systematic methods of computation are presented in chapter appendixes. This format is undoubtedly effective, but because it begins with the data rather than with the collection of the data, the importance of the planning of the experiment is obscured. Proper experimental design is essential in obtaining statistical data worthy of analysis by means of the techniques given in this book.

Those who are interested chiefly in practical applications will find much information gathered together in the handbook. The book, as it stands, should be most useful to the industrial investigator. The typography is exceptionally good. Misprints are rare and unimportant. It is to be hoped that, in future revisions, inclusion will be made of recent and powerful statistical techniques, such as sequential sampling and non-parametric tests, which can be very useful in industrial research and production engineering.

Recent Books & Pamphlets

Standards of Tubular Exchanger Manufacturers Association. Second edition. Published by Tubular Exchanger Manufacturers Association, Inc., 53 Park Pl., New York 7, N. Y. 94 pages. $3. Fabrication and performance; mechanical standards for petrolem refineries; material specifications.

Directory of Tennessee Industries. 1949 edition. By Walter C. Long. Published by Tennessee State Planning Commission, 417 Seventh Ave. North, Nashville, Tenn. 286 pages. $5. Listings are by towns and cities, cross-indexed by products and firm names.

Proper Sizing of Excavators and Hauling Equipment. Technical Bulletin No. 3, published by Power Crane and Shovel Association, 74 Trinity Pl., New York 6, N. Y. 24 pages. 50 cents. Analysis of factors affecting operation. Performance tables in relation to factors are given.

Lactic Acid and Lactates. By H. C. Needle and R. S. Aries. Published by R. S. Aries & Associates, 26 Court St., Brooklyn 2, N. Y. 30 pages. Gratis. Process of manufacturing plastic and USP grades of methyl lactate by fermentation of sugarcane molasses at costs of about six cents per pound for methyl lactate and below ten cents per pound for lactic acid.

Flow Characteristics of Gas Lift in Oil Production. By S. F. Shaw. Bulletin 113, published by the Texas Engineering Experiment Station, Agricultural and Mechanical College of Texas, College Station, Tex. 90 pages. Gratis. Experiments with the productive capacities of several diameters of pipe of various lengths when lifting oil and water by means of air lift.

Gulf Coast Chemical Industry, October 1949. Published by Research Dept., Houston Chamber of Commerce, Houston, Tex. 17 pages. Lists chemical plants and their products located on Gulf Coast from Lake Charles, La., to Brownsville, Tex.

Lime, Handling, Application and Storage. By Willem Rudolfs. Bulletin 213 published by National Lime Association, Washington 5, D. C. 71 pages. 50 cents. Manual to aid in selection and handling of proper type of lime for particular requirements in water, sewage and trade waste treatment or industrial processes.

Review of Current Research and Directory of Member Institutions. Published by the Engineering College Research Council, American Society for Engineering Education, College of Engineering, State University of Iowa, Iowa City, Iowa. By J. I. Mattill and J. P. Weber. 186 pages. $1.75. For 82 member institutions, lists administrative policies for conducting engineering research, responsible personnel, research expenditures, short courses and conferences of special interest, titles of engineering research studies currently active.

Commodities Series. Available from Food and Agriculture Organization, 1201 Connecticut Ave., N. W., Washington 6, D. C., or International Documents Service, Columbia University Press, 2960 Broadway, New York 27, N. Y. No. 8, Sugar, 25 cents. No. 9, World Fibers Review 1948, 25 cents. No. 13, Fats and Oils, 50 cents. No. 14, World Fiber Review 1949, 50 cents. No. 17, Commercial Fertilizers, 50 cents.

Efficient Use of Fertilizers. Available from Food and Agriculture Organization, 1201 Connecticut Ave., N. W., Washington 6, D. C., or International Documents Service, Columbia University Press, 2960 Broadway, New York 27, N. Y.

The Smog Problem in Los Angeles County. Second Interim Report, published by the Committee on Smoke and Fumes, Western Oil and Gas Association, 510 West Sixth St., Los Angeles 14, Calif. 64 pages. Gratis. Results to date in a two-year investigation of the source, nature and mechanism of Los Angeles smog.

Red Lead Paints for Marine Exposures. Red Lead Technical Letter No. 4 published by Lead Industries Association, 420 Lexington Ave., New York 17, N. Y. 9 pages. Gratis. Formulations of high performance synthetic vehicle paints for marine atmospheres.

Studies on the Production of Antimony Oxide. By Joseph Newton and W. D. Wilde. Special Research Project No. 12 Pamphlet No. 89, published by the University of Idaho, Moscow, Idaho. 52 pages. Gratis. Describes the making of a number of samples of oxides at different temperatures and with different amounts of oxidizing and quenching air.

Transactions of the Institution of Chemical Engineers, 1946. Vol. 24, published by the Institution of Chemical Engineers, 56, Victoria St., Westminster, London, S.W. 1, England. 141 pages.

Iron Bearing Deposits in Washington, Oregon and Idaho. By Carl Zapffe. Report No. 5, published by the Raw Materials Survey, Inc., 701 Woodlark Bldg., Portland 5, Ore. 89 pages. $2.50. Factual information on raw materials for industries in the Columbia River Basin.

Bessemer Process. Special Report No. 42, published by the British Iron and Steel Research Association, 4 Grosvenor Gardens, London, S. W. 1, England. 80 pages. 25s. British, foreign and future Bessemer practice.

What Are New Chemicals Good For? Published by Stanford Research Institute, Stanford, Calif. $1. Proceedings of sym-

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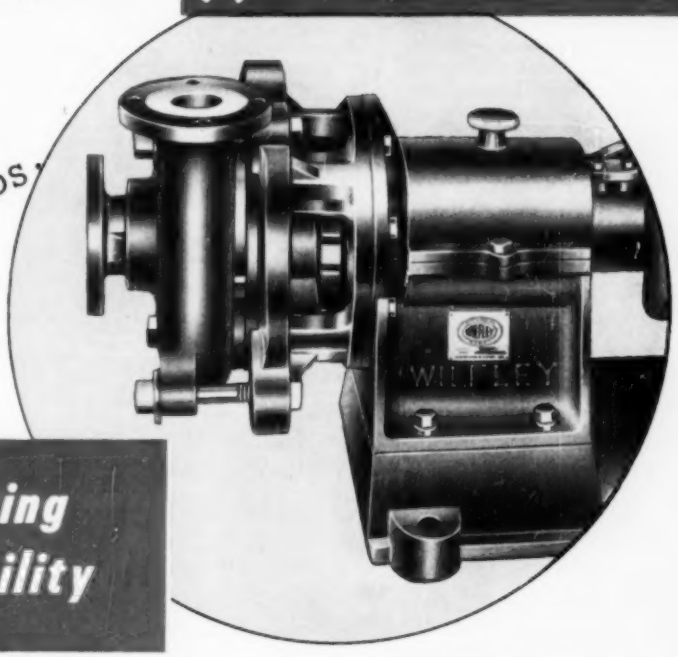

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BOOKS & PAMPHLETS, *cont.* . .

posium held by section on chemical marketing at the 115th meeting of American Chemical Society in San Francisco. Includes talks and round-table discussion which followed.

Steel Making in America. By Douglas A. Fisher. United States Steel Corp., 71 Broadway, New York 6, N. Y. 100 pages Describes the manufacture of steel in the United States from raw materials through finished steel products. Designed principally for school students. Generously illustrated.

GOVERNMENT PUBLICATIONS

The following recently issued documents are available at prices indicated from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. In ordering any publications noted in this list always give complete title and the issuing office. Remittances should be made by postal money order, coupons, or check. Do not send postage stamps. All publications are in paper cover unless otherwise specified. When no price is indicated, the pamphlet is free and should be ordered from the bureau responsible for its issue.

Trade. "General Agreement on Tariffs and Trade." Department of State. Publication 3651, Commercial Policy Series 120. Price 50 cents. Preliminary analysis of protocol of accession and schedules to the general agreement on tariffs and trade negotiated at Annecy, France, April-August 1949.

Agriculture. "Soil, People, and Fertilizer Technology." Tennessee Valley Authority. Price 30 cents.

Water. "Surface-Water Records." U. S. Geological Survey has issued a series of mimeographed circulars which index the special reports which have been prepared and made available for public inspections on the surface water supply of the country. Separate indexes are available for ten or a dozen of the principal drainage basins. Description of wanted information will permit the survey to supply either indexes or individual reports. Obtain from Director, Geological Survey, Washington 25, D. C.

Geology. "Preliminary Maps and Reports." By R. A. Atherton et al. Geological Survey Circular 56. Obtain from Director, Geological Survey, Washington 25, D. C. A list of preliminary maps and reports released by the Geologic Division 1946-1947 and by the Conservation Division 1938-47, giving detailed information which is not yet in printed document form. An excellent reference list.

Research. "Publications and Patents of the Eastern Regional Research Laboratory, 1939-June 1949." Bureau of Agricultural and Industrial Chemistry. AIC-180. A bibliography. Mimeographed.

Census. "Census of Manufactures." Now available are all 82 commodity reports on the Census of Manufactures, 1947. These are the preprint chapters of complete Volume II of Statistics by Industry. The latter volume is expected to be available during mid-Winter. Individual pamphlets are from 10 to 20 cents each. The bound volume will be $4.50. Detailed information should be sought by those interested from the Superintendent of Documents, Government Printing Office, Washington

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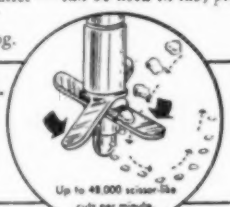

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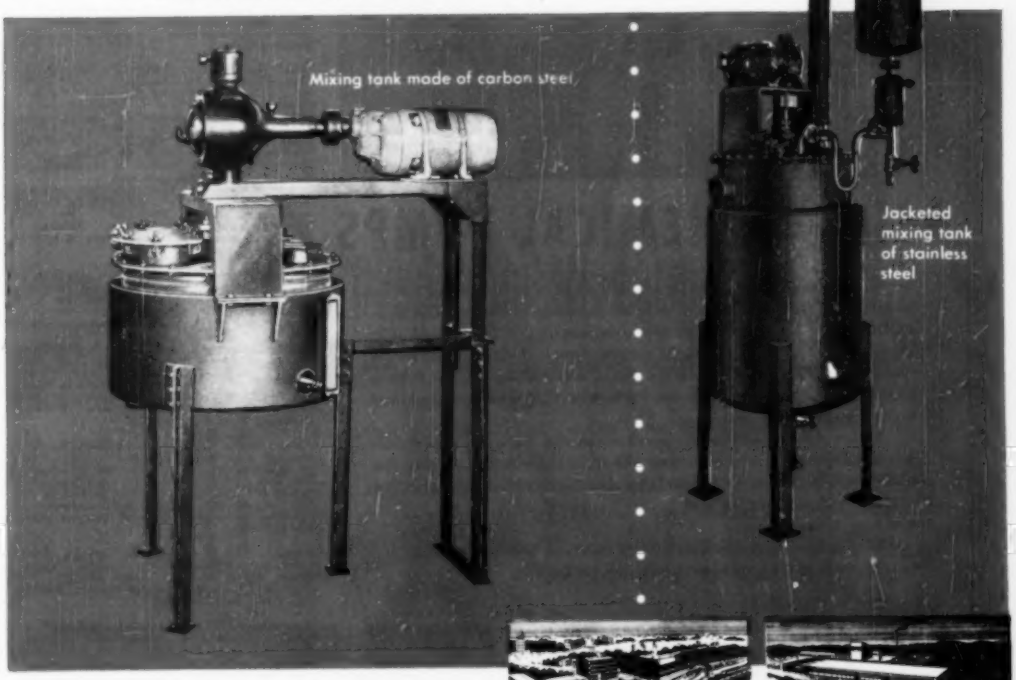

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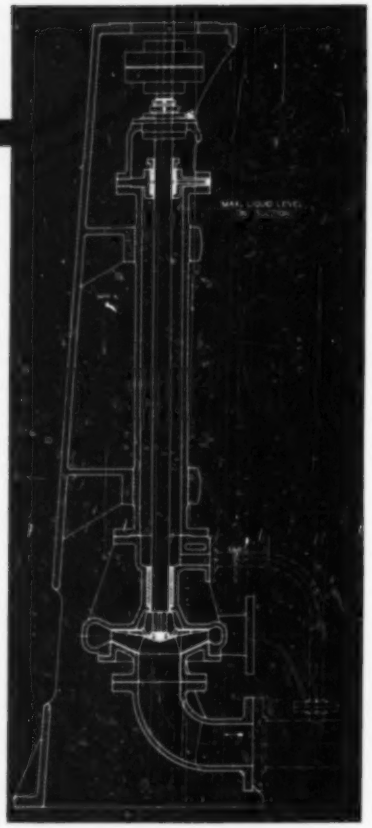
(Right) Structural details of Lawrence Vertical Acid Pump.

(Below) Vertical Acid Pump for outside mounting.



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Agriculture. "Milk-Production Value of a Concentrate Mixture Composed Entirely of Southern Agricultural Byproducts." By F. W. Faires et al. Department of Agriculture, Circular No. 811. Price five cents.

Analysis. "Methods of Determining the Oil Content of Tung Fruits and Factors Affecting It." By Felix S. Lagasse, et al. Department of Agriculture, Circular No. 806. Price 10 cents.

Minerals. "Preliminary Minerals Reports." U. S. Bureau of Mines Preprints from Minerals Yearbook 1948. Individual commodity reports and reports for states and groups of states are now being published. These give in printed form the information which will later appear in the Minerals Yearbook, perhaps a year from now.

Molybdenum. "Molybdenum." By H. W. Davis. Preprint from Bureau of Mines Minerals Yearbook 1948. Price five cents.

Minerals. "Fluorspar and Cryolite." By H. W. Davis. Preprint from Bureau of Mines Minerals Yearbook 1948. Price 10 cents.

Coal. "Annual Report of Research and Technologic Work on Coal Fiscal Year 1948." By A. C. Fieldner and S. Gottlieb. Bureau of Mines, Information Circular I. C. 7518. Mimeographed.

Petroleum. "Petroleum Refineries, Including Cracking Plants in the United States, January 1, 1949." By F. S. Lott and I. S. Culver. Bureau of Mines, Information Circular I. C. 7537. Mimeographed.

Liquid Fuels. "Revised Bibliography of Bureau of Mines Investigations on the Production of Liquid Fuels from Oil Shale, Coal, Lignite, and Natural Gas (to 1949)." By Norma Columbic, et al. Bureau of Mines, Information Circular I. C. 7534. Mimeographed.

Analysis. "The Determination of Low Concentrations of Hydrogen Sulfide in Gas by the Methylene Blue Method." By A. E. Sands, et al. Bureau of Mines, Report of Investigations R. I. 4547. Mimeographed.

Coal. "Studies of the Kinetics of Coal Hydrogenation." By M. G. Pelipetz, et al. Bureau of Mines, Report of Investigations R. I. 4546. Mimeographed.

Titanium. "Titanium Minerals in Central and Northeastern Florida." By J. R. Thoenen and J. D. Warne. Bureau of Mines, Report of Investigations R. I. 4515. Mimeographed.

Porosity. "A Bureau of Mines Method for Determining Porosity: A List of Porosities of Oil Sands." By C. G. Rall and D. B. Taliaferro. Bureau of Mines, Report of Investigations R. I. 4548. Mimeographed.

Food. "Consumption of Food in the United States, 1909-48." Department of Agriculture, Miscellaneous Publication No. 691. Price 65 cents. A resume which is valuable for chemical market studies in many cases where chemical sales depend on the magnitude of food usage.

Agriculture. "Agricultural Geography of Europe and the Near East." Department of Agriculture, Miscellaneous Publication No. 665. Price $1.00. An excellent geography of little-known areas including certain goods movements and consumption relating to commodities of process industry interest.

Smog. "Air Pollution in Donora, Pennsylvania.—Epidemiology of the Unusual Smog Episode of October 1948." Preliminary Report. Public Health Bulletin No. 306. Price $1.25.

Agriculture. "Agricultural Outlook." Annual reports and charts are currently available from Department of Agriculture showing prospective production, marketing, and other pertinent economic data. Process industry having any relation of agricultural raw materials or agricultural markets should request from the Bureau of Agricultural Economics the Outlook Situation on pertinent commodities. Also available is Agricultural Outlook Charts, a graphic presentation of some of the more important statistical material.

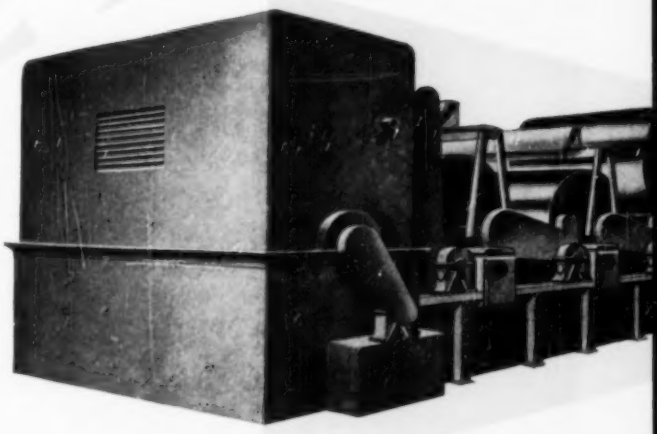
—*End*

as you were in 1900

Individual skill and rule-of-thumb methods were the dominant factors in textile processing as in many other fields such as paper, glass and soap-making, and sewage disposal

as you are today

Speed, accuracy and scientific control are the keynotes in modern textile production



. . . with a helping hand from Niagara Alkali

Huge, complex and increasingly progressive, the textile industry has made truly remarkable progress since the turn of the century. New methods, new finishes, new fibres have added vastly to the beauty, durability and variety of its range of fabrics.

By pioneering the domestic production of liquid chlorine, caustic soda and other electro-chemicals, Niagara Alkali has helped to make such improvements possible. Niagara's pioneering has also greatly benefited the paper, glass, soap and other industries. Look to Niagara for pioneer quality and service in electro-chemical products.

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MANUFACTURERS' LATEST PUBLICATIONS

Publications listed here are available from the manufacturers themselves, without cost unless a price is specifically mentioned. To limit the circulation of their literature to responsible engineers, production men and industrial executives, manufacturers usually specify that requests be made on business letterheads.

High Vacuum. Central Scientific Co., 1702 Irving Park Rd., Chicago 13, Ill.—48-page pamphlet contains suggestions for planning a high-vacuum system; data on pumping speed; explanation of merit factor, connections and speed of evacuation. Lists line of pumps and other vacuum accessories.

Process Equipment. John Van Range Co., 354-384 Eggleston Ave., Cincinnati, Ohio.—8-page booklet contains photographs of examples of custom-made stainless equipment for the process industries.

Cleaners. Sumco Products, Inc., 144-146 Centre St., Brooklyn 31, N. Y.—4-page leaflet describes a chemical cleaning service for steam boilers, condensers, feedwater heaters and other heat exchange equipment.

Plasticizers. Tennessee Eastman Corp., Kingsport, Tenn.—12-page booklet gives specifications, properties and a brief description of each plasticizer in this company's line.

Solvent. E. F. Houghton & Co., 303 West Lehigh Ave., Philadelphia 33, Pa.—6-page folder describes fuel oil additive for dissolving sludge in oil storage tanks and systems. Contains an analysis of the sludge problem and describes the use and physical composition of the solvent.

Corrosion. U. S. Stoneware Co., Akron 9, Ohio.—8-page Bulletin M suggests corrosion resistant materials for tubing and gasketing, lining materials, grinding and mixing equipment, masonry, etc.

Instruments. Allis-Chalmers Mfg. Co., 1147 South 70th St., Milwaukee, Wis.—20-page Bulletin 14B7217A treats electronic metal detector for use on conveyor installations. Sketches show construction and installations.

Pumps. Duriron Co., 17 East 42nd St., New York 17, N. Y.—4-page Bulletin 816 illustrates and describes self-priming pumps made in any of a variety of alloys.

Insulation. Owens-Corning Fiberglas Corp., Toledo 1, Ohio.—12-page booklet, A.I.A. File No. 30-A describes use of glass fiber duct insulating materials. Includes charts showing thermal conductivity and other product data.

Generators. Electric Machinery Mfg. Co., Minneapolis 13, Minn.—8-page Bulletin 2200-PRD-196 treats construction features and how they are put to use.

Motor Accessory. Allis-Chalmers Mfg. Co., 1147 South 70th St., Milwaukee, Wis.—4-page Bulletin 14H7274 illustrates and describes a wall-mounted starter for squirrel cage motors and the primary of wound rotor motors of 350 horsepower or less at 2300 volts.

Distillation. Arthur D. Little, Inc., 30 Memorial Dr., Cambridge 42, Mass.—4-page leaflet explains compression distillation and its applications.

Resin. Hercules Powder Co., Synthetics Dept., Wilmington, Del.—4-page Bulletin

(Continued)

There is nothing "Special" about
FILTER UNITS fabricated by
MULTI-METAL.

Special filter unit fabrications are routine production to Multi-Metal. More than 35 years of specialized handling of filter units in the processing industries go into every filter job constructed by Multi-Metal. All operations are handled right at our plant. This basket for example: a heavy mesh screen is shown being fitted to a sheet metal cylinder. It's typical of hundreds of other Multi-Metal jobs. Let us apply our special technique acquired over more than 35 years.

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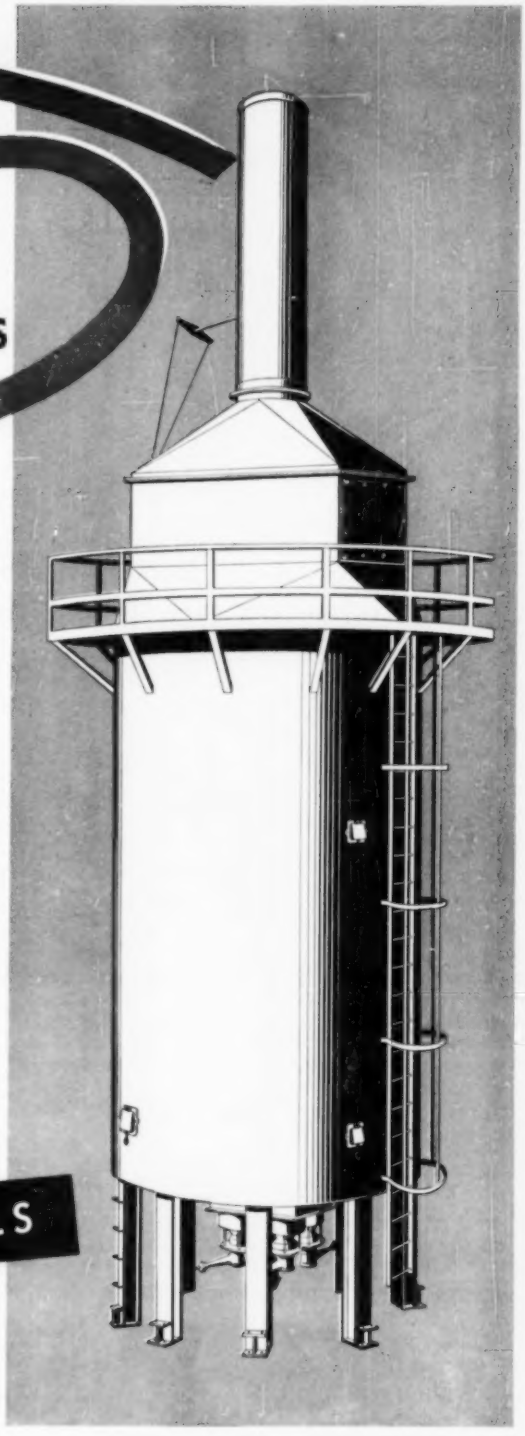

An efficient, trouble-free system for high temperature heating service

Struthers Wells direct fired systems for heating by means of circulating heat transfer mediums have been in successful use for many years. This system, including a tubular fired heater and pump circulated heating medium, has proven economical and trouble free for high temperature heating service.

In addition to the heater, equipment is usually supplied to give a complete installation, including temperature control and safety devices.

Except for largest sizes, the heater and other equipment is shipped complete and ready for erection.

This equipment is widely used for heating grease and resin kettles, reboilers, fatty acid stills, deodorizers, special board presses, and other services requiring temperatures from 450° F. to 750° F. or above. Many processes can be improved or operation speeded by using higher temperatures not ordinarily available with steam heating.

Heaters are available in a wide range of standard sizes, including pilot plant units.

Bulletin A-45 describing this equipment is available.

Struthers Wells

STRUTHERS WELLS

CORPORATION

Process Equipment Department

WARREN, PENNA.

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How workers look at safety goggles . . .

"Are they comfortable?"

The answer to that question in your plant will determine to a large extent how effective your safety program is.

MonoGoggle Style No. 1

To most workers, comfort—or the lack of it determines whether or not they wear goggles or carry them around in their pockets. Whether they need safety spectacles, heavy duty goggles or plastic eye protection for minor hazards—look to the WILLSON line for comfort that gets safety equipment worn. The lightest weight commensurate with safety in a given operation; a choice of sizes; adjustability for exact fit; anatomically shaped eye cups and frames; and other comfort features make WILLSON safety equipment "easy on the eyes."

NEW CATALOG

In addition to product information, it contains information on safety glass, filter glass, respiratory hazards, etc., which will help you select proper safety equipment to meet specific hazards. Send for it!

WILLSON

"Established 1870"

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WILLSON PRODUCTS, INC., 223 WASHINGTON STREET, READING, PENNA.

MFRS. PUB., cont. . .

S-46 describes an alkyd resin based on pentaerythritol for use in white high-bake finishes.

Valves. Crane Co., 836 South Michigan Ave., Chicago 5, Ill.—4-page leaflet illustrates and describes fluid-motor operated gate valves.

Speed Reducers. Cleveland Worm and Gear Co., 3293 East 80th St., Cleveland 4, Ohio.—8-page leaflet illustrates and describes a line of fan-cooled worm gear speed reducers.

Chemicals. Koppers Co., Chemical Div., Pittsburgh 19, Pa.—8-page Bulletin C-9-53 describes physical and chemical properties of and recommends uses for meta-benzenedisulfonic acid, an intermediate compound.

Pumps. Nagle Pumps, 1249 Center Ave., Chicago Heights, Ill.—36-page Catalog 4906 covers pumps for abusive applications and priming indicators. Includes data on installation and design.

Wire Belts. Cambridge Wire Cloth Co., Cambridge, Md.—4-page Bulletin No. 97 illustrates chain driven woven wire conveyor belts.

Pumps. Waukesha Foundry Co., Waukesha, Wis.—12-page Bulletin 1947-900 describes construction and operating features of stainless steel displacement pumps.

Instruments. Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland 10, Ohio.—16-page Bulletin 150-A describes design and applications for electronic combustibles recorder. Includes charts and installation sketches to illustrate applications.

Valves. Yarnall-Waring Co., Chestnut Hill, Philadelphia 18, Pa.—8-page Bulletin B-440 describes the use of seatless blow valves on large digesters for cooking paper pulp. Includes dimensions and installation views.

Nitrosyl Chloride. Allied Chemical & Dye Corp., Solvay Process Div., 40 Rector St., New York 6, N. Y.—16-page booklet NC-2 gives properties and reactions. Much of the material is in chart form.

Detergents. General Aniline & Film Corp., 444 Madison Ave., New York 22, N. Y.—12-page leaflet features chart giving trade name, physical state, chemical family and uses of a line of surface active agents.

Liquids Handling. Ertel Engineering Corp., Kingston, N. Y.—16-page booklet illustrates and discusses the use of a line of filters, filter sheets, pumps, bottle fillers and mixers.

Drying Equipment. Proctor & Schwartz, Inc., Seventh St. and Tabor Rd., Philadelphia 20, Pa.—8-page Bulletin 242 describes a line of drying equipment and this company's research policy.

Humidifiers. Armstrong Machine Works, Three Rivers, Mich.—12-page Bulletin 1772 discusses dry air problems and operation and installation of humidifiers. Includes tables on desirable relative humidities.

Scale Models. Raymond A. Lester Associates, 39 East Prospect Ave., Mount Vernon, N. Y.—8-page brochure illustrates the use of scale models in making plans.

Pumps. Byron Jackson Co., Pump Div., Terminal Annex Box 2017, Los Angeles 54, Calif.—8-page Bulletin 49-6600 outlines general assembly, construction detail, and dimensions.

Process Equipment. Black, Sivalls & Bryson, Inc., 720 Delaware, Kansas City 6, Mo. 20-page booklet gives capacities, specifications and photographs of equipment for use in refineries. Includes data on heaters, separators, gas scrubbers and dehydrators.

Electric Heaters. Edwin L. Wiegand Co., 7514 Thomas Blvd., Pittsburgh 8, Pa.—48-page Catalog 50 includes uses and construction data, prices and standard ratings for various types of units.

Pumps. Buffalo Pumps, Inc., Buffalo 5, N. Y.—32-page Bulletin 364-E shows construction of raw sewage pumps and sewage ejectors. Contains cross-sectional views with detailed labeling of parts. Gives full instructions for installation and operation.

(*Continued*)

LIGHTNING PRODUCES FERTILIZER, TOO

Nature's fireworks—by transforming the inert nitrogen in the air to nitric acid — produce much more fertilizer per year than do Chemico-built plants. But lightning scatters its benefits without consideration for those who need them. Chemico-built plants, on the other hand, produce the kind of commercial fertilizer you want . . . where you want it . . . when you want it . . . in the concentration you want . . . at a very reasonable price.

Chemico offers a complete engineering and contracting service to the fertilizer industry, ranging from the design and construction of complete fertilizer works to furnishing small individual units and auxiliary plants of a specialized nature. From Pittsburgh to Pakistan, from Colombia to China, Chemico has been building such plants since 1914. Chemico brings to each new project a wealth of experience, proven methods and guaranteed performance.

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NEVERSTOP automatically feeds the cartons . . . bottom seals . . . fills . . . then seals the carton tops. *There is no stopping!* After the cartons are fed into the machine, they move in a smooth never-ending line, rapidly to completion and packing. NEVERSTOP is built in 3 models and will fill up to 160 or more units per minute.

For nearly 50 years, Stokes and Smith have been recognized as builders of "Better Machines for Better Packaging". If your products require, wrapping, sealing, or filling in bags, boxes, cartons, bottles or cans, there is an S & S machine to do it swiftly, neatly and accurately.

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MFRS.' PUB., cont. . .

24-page Bulletin 955-N illustrates and describes a line of double suction single stage pumps. Includes rating tables and dimensions.

Corrosion Resistance. Taylor Forge & Pipe Works, P. O. Box 485, Chicago 90, Ill.—32-page Bulletin 425 treats stainless steel and nickel alloy corrosion resistant piping. Tables give dimensions, degree of resistance of alloys to corrosive substances.

Gear Drives. Foote Bros. Gear and Machine Corp., 4545 South Western Blvd., Chicago 9, Ill.—16-page Engineering Manual MPA gives service factors and load characteristics, dimensions and ratings of enclosed helical gear drives.

Equipment. Farrel-Birmingham Co., Ansonia, Conn.—40-page Bulletin 173 contains diagrams and photographs of rubber and plastics mills. Includes a table of sizes, capacities, power requirements, overall dimensions. Gives general specifications of variety of attachments.

Plastics. Formica Co., 4613 Spring Grove Ave., Cincinnati 32, Ohio.—16-page booklet contains several tables showing properties of a laminated thermosetting plastic. Photographs illustrate how these properties may be put to use.

Air Conditioning. Buffalo Forge Co., P. O. Box 985, Buffalo 5, N. Y.—16-page Bulletin 3158-B includes charts and diagrams showing specifications, operating features and construction of air conditioning equipment.

Hose. Resistoflex Corp., Belleville 9, N. J.—4-page booklet describes flexible hose assemblies for original equipment. Cites typical uses.

Pulverizers. Pulverizing Machinery Co., Chatham Rd., Summit, N. J.—50-page spiral booklet describes operation and uses. Illustrates construction details of various models.

Pumps. De Laval Steam Turbine Co., Trenton 2, N. J.—Catalog describes two and four stage unit impeller pumps. Includes rating and dimension tables.

Materials Handling. Fuller Co., Catasauqua, Pa.—24-page Bulletin A-15 describes a penumatic conveying system for dry pulverized, crushed and granular materials. Diagrams and photographs show typical installations.

Pumps. Milton Roy Co., 1300 East Mermaid Lane, Philadelphia 18, Pa.—4-page Bulletin 649 illustrates and describes principles of design and application of a double plunger controlled volume pump.

Tube Expanders. Thomas C. Wilson, Inc., 21-11 44th Ave., Long Island City 1, N. Y.—8-page Bulletin 380 illustrates and describes a line of tube expanders for high pressure boilers. 6-page Bulletin 420 describes expanders incorporating an adjustable ball bearing thrust collar for heat exchangers.

Blowers. Roots-Connersville Blower Corp., 900 West Mount St., Connersville, Inc.—8-page Bulletin 21-B-27 covers small rotary positive blowers for pressure or suction service. Graphs show operating characteristics under constant, variable, and multi-speed operation.

Rust Resistance. Esso Standard Oil Co., 15 West 51st St., New York 19, N. Y.—12-page booklet D229-J5 describes the properties and use of a line of rust preventatives.

Silicates. Philadelphia Quartz Co., Public Ledger Bldg., Philadelphia 6, Pa.—15-page pocket-sized booklet contains a chart giving the suggested uses, properties and pertinent features of a group of soluble silicates.

Chemicals. Fritzsche Brothers, Inc., Port Authority Bldg., 76 Ninth Ave., New York 11, N. Y.—12-page price list covers essential oils, aromatic chemicals and allied products.

Cooling Towers. C. H. Wheeler Mfg. Co., 19th and Lehigh, Philadelphia 32, Pa.—16-page booklet of instructions on maintenance of cooling towers.

Pumps. Kinney Mfg. Co., Boston, Mass.—20-page booklet entitled "Pumping Viscous Materials" from a paper by William E.

(Continued)

Instant Acceptance!

AO
R5000 LINE of
Twin Cartridge
Dust, Gas, Vapor
Respirators

Approved by U.S. Bureau of Mines for Organic Vapors and Gases and all Dusts

AO's "7 Respirators-in-1" simplifies protection, offers many advantages

Ring accepts either chemical cartridge or dust filter assembly

QUICK FACTS NEW THREADED CARTRIDGES—Wider, for lower breathing resistance. To interchange, merely unscrew one cartridge and screw in another for gas-tight seal.

NEW FILTER RETAINER ASSEMBLY — Takes either chemical cartridges or flat disc of chemically treated felt.

NEW FACE PIECE— Non-leaking, snug fitting, comfortable, of durable, pure rubber.

SUPERIOR VISUAL AREA—New slender cartridge design and lower location of cartridge afford wider field of vision.

NEW FLEXIBLE FITTING BRACE—Face piece adapts to features of wearer by slightest hand pressure on brace for perfect fit. Headband pressure cannot pull pliable rubber face piece out of shape.

NEW INHALATION AND DRAIN VALVE DESIGNS—Provide positive action, thorough drainage and no interference by clothes or face.

NEW INVENTORY ECONOMY—"7 respirators-in-1" permits standardization, hence smaller inventories.

Double length headband permits "parking" of respirator around neck when not in use. Auxiliary filters available which extend cartridge filter life.

Announced only recently, the AO R5000 line of Twin Cartridge Respirators featuring new *interchangeable* cartridges and disc filter, has already been widely acclaimed for the ease with which it solves varied respiratory problems. Using a single face piece, the equipment quickly converts to the type of gas or vapor respirator required—with a chemically treated felt filter for dust protection.

Your nearest AO Safety Products Representative can supply you

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Whatever your hazard, PYRENE'S the buy!

VAPORIZING LIQUID

The all-purpose extinguisher effective on almost every kind of fire. Safe on electrical fires, too. 1 qt. and 1½ qt. pump types; 2 qt. and 1 gal. pressure-operated types.

MANUAL AND AUTOMATIC SYSTEMS

Complete fire-fighting systems, using chemical foam or air foam. For storage tanks, dip tanks, loading racks, etc.

AIR FOAM

Couple Playpipe to hose line. Every 15 gals. of water and 1 gal. of PYRENE Foam Compound yield 350 gals. of foam! For flammable liquids and ordinary combustibles.

CARTRIDGE-OPERATED

Eliminates annual recharging. For fires in wood, paper, textiles. Shoots water or anti-freeze solution. 2½ gal. size.

Also Soda Acid, Pump Tank, Chemical Foam, and other extinguishers.

THERE'S A PYRENE* for every fire hazard... and there are PYRENE jobbers in all principal cities. You can order all your extinguisher needs —the reliable, prompt, economical, easy way— from one local establishment. You can do it on one purchase order. You get immediate delivery by the jobber, and you don't have to pay freight charges from the factory.

The name PYRENE stands for precision-made, time-tested products. Your fire extinguishers can mean the difference between a moment's excitement and a burned-out plant. Don't settle for less than PYRENE quality! Write for name of your local PYRENE jobber.

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MFRS.' PUBS., cont. . .

Worcester. Generously illustrated by charts, curves and photographs.

Centrifuges. Sharples Corp., 2301 Westmoreland St., Philadelphia 40, Pa.—24-page Bulletin 1248 illustrates and describes operating details for a line of centrifuges. Included specifications and application data.

Piping. Michigan Pipe Co., City, Mich.—4-page leaflet contains a chart giving application data on wood stave, wood lined, saran rubber lined, stainless steel, and Monel metal piping.

Water Conditioning. Graver Water Conditioning Co., Dept. 108, 216 West 14 St., New York 11, N. Y.—8-page Bulletin WC-100 contains installation views of such water conditioning equipment as hot-process and zeolite softeners, demineralizers, clarifiers, filters.

Fatty Acids. Wilson & Co., Wilson-Martin Div., Snyder Ave. and Swanson St., Philadelphia 48, Pa.—Cardboard wheel chart shows properties of common fatty acids.

Gages. Parker Appliance Co., 17325 Euclid Ave., Cleveland 12, Ohio.—Bulletin 380 describes pressure gage snubber's action in protecting gages from line shocks.

Process Equipment. Continental Industrial Engineers, Inc., 176 West Adams St., Chicago 3, Ill.—12-page booklet describes the variety of plants this company can design, construct and equip. Industries served include chemical, petroleum, plastic, textile and ceramic.

Valves. Crane Co., 836 South Michigan Ave., Chicago 5, Ill.—4-page leaflet shows cross-sectional views of automatic stop-check valves. Sizes, dimensions, list prices.

Resins. Bakelite Corp., 30 East 42nd St., New York 17, N. Y. 14-page booklet discusses applications for polystyrene and vinylite resins.

Materials Handling. Colson Equipment & Supply Co., 1317 Willow St., Los Angeles. 8-page booklet covers a dumper for lifting, up-ending and dumping bags, boxes, barrels and drums. Shows varieties and sizes available.

Oil Filters. Winslow Oil Filters, Winslow Engineering Co., 4049 Hollis St., Oakland, Calif.—4-page folder describes oil filter for removing acids, moisture and abrasives. Includes application photographs.

Waste Disposal. F. S. Gibbs, Inc., 43 Leon St., Boston 15, Mass.—18-page booklet illustrates and fully describes a unit for removing and recovering fatty acids, fatty acid emulsions and insoluble soaps from soap manufacturing waste cooling waters.

Instruments. Sperry Products, Inc., c/o E. B. Lang, Danbury, Conn.—4-page Bulletin 50-105 describes and illustrates an ultrasonic device for locating defects in metals and other materials.

Pump. Goulds Pumps, Inc., Seneca Falls, N. Y.—8-page Bulletin 725.3 covers stainless steel centrifugal pumps for handling corrosive liquids. Includes design features, performance curves and specifications.

Turbines. De Laval Steam Turbine Co., Trenton 2, N. J.—24-page Catalog 4200 contains sketches of basic type turbines with their operating conditions and applications. Includes application photographs.

Process Equipment. Black, Sivalls & Bryson, Inc., 720 Delaware, Kansas City 6, Mo.—20-page booklet describes steel equipment for the process industries. Includes photographs and specifications for dehydrators, heaters, chemical feeders and tanks.

Calcium Carbide. National Carbide Corp., Rm. 1656, 60 East 42nd St., New York 17, N. Y.—16-page booklet traces the history of calcium carbide. Points out that acetylene was first used as an illuminating gas, then as a fuel gas in metal welding and cutting and now in the manufacture of plastics and synthetic rubbers. Potential uses are discussed.

Valves. R-S Products Corp., Wayne Junction, Philadelphia 44, Pa.—12-page Catalog 18 on line of 50-pound valves. Contains sketches and size charts for various models in line. 2-page leaflet, gives photographs and dimensions of liquid shock absorbers.

—*End*

ONE TANK'S PERFORMANCE OVER 21 YEARS

THE statistics below give the performance figures of *one* glass furnace, melting flint glass, for thirteen consecutive fires, over a period of twenty-one years.

It is a record of progress made possible by advances in furnace design and operation, and in the use of better refractories.

Corhart Refractories, Company, *Incorporated*
16th and Lee Streets, Louisville 10, Kentucky

The words "CORHART," "ELECTROCAST," "ZED," and "ZAC" are Trade Marks which indicate manufacture by Corhart Refractories Company, Incorporated.

PERFORMANCE DATA FOR ONE TANK OVER A PERIOD OF 21 YEARS

LIFE → / DATES → / MATERIALS →	7 Months JAN '28 JULY '28 All Clay Fire-Brick	23 Months SEPT '28 MAY '30 All Clay Fire-Brick	10 Months JUNE '29 APR '30 Corhart Standard Throat and Port Blocks, 17" M & T Sidewalls	16 Months JUNE '30 SEPT '31 Corhart Standard Throat and Port Blocks, 17" M & T Sidewalls and Tile Crown, Corhart Lower Course	13 6 Months NOV '31 DEC '32 Corhart Standard Throat and Port Blocks, 17" M & T Walls	12 4 Months FEB '33 MAR '34 Corhart Standard Throat and Port Blocks, 17" M & T Walls, 17" Bridge	20 Months MAY '34 DEC '35 Corhart Standard Throat and Port Blocks, 17" M & T Walls and Tile Crown, 17" M & T Bridge (1)	16 6 Months JAN '36 JUNE '37 Corhart Standard Throat and Port Blocks, 17" M & T Walls and Tile Crown, 17" M & T Bridge (1)	17 1 Months JULY '37 NOV '38 Corhart Standard Throat and Port Blocks, 17" M & T Walls, 17" M & T Bridge (1)	24 6 Months FEB '39 MAR '41 Corhart Standard Throat and Port Blocks, 17" M & T Walls, 17" M & T Bridge (1)	27 1 Months APR '41 JULY '43 Corhart Zed Throat and Port Blocks, Standard Walls, 17" M & T Bridge (1) Pilot Stage Bottom (1) Pilot Stage Front Plate	32 7 Months SEPT '43 MAY '46 Corhart ZAC Throat and Port Blocks, 17" M & T Walls (1) Corhart Standard Walls, 17" M & T Bridge (1) Pilot Stage Bottom (1) Pilot Stage Front Plate	29 7 Months JULY '46 DEC '48 Corhart ZAC Throat and Port Blocks, 17" M & T Walls (1) Corhart Standard Walls, 17" M & T Bridge (1) Pilot Stage Bottom (1) Pilot Stage Front Plate
MELTING AREA (SQ FT)	834	834	834	834	834	834	834	854	854	834	834	834	834
TOTAL DAYS (OE)	210	246	300	482	405	413	600	500	514	718	813	957	890
TOTAL OPERATING DAYS	175	201	249	365	330	335	500	437	418	634	738	748	735
TONS GLASS DELIVERED	6648	8620	10356	16400	17561	19873	39134	47753	40861	57037	77485	69897	65767
TONS GLASS PER OPERATING DAY	37.99	42.89	41.59	44.93	53.22	59.32	78.27	109.27	97.75	89.98	104.99	93.44	89.48
SQ FT MELTING AREA PER TON GLASS PER DAY	21.9	19.4	20.3	21.8	17.8	16.5	10.7	7.8	8.7	8.2	7.9	8.9	9.3
TOTAL TONS COAL USED	4592	4810	6215	10540	10680	10708	19154	17176	17757	27179	32338	38322	35559
TOTAL TONS COAL USED ON OPERATING DAYS	3730	4187	5445	8630	9232	8892	17024	16002	15084	24544	30512	32223	29106
BTU PER TON GLASS DELIVERED	103348 x10⁶	89495 x10⁶	96800 x10⁶	96880 x10⁶	99785 x10⁶	82371 x10⁶	80089 x10⁶	61691 x10⁶	70665 x10⁶	86833 x10⁶	72495 x10⁶	84870 x10⁶	81476 x10⁶
COAL EQUIVALENT AT 13150 BTU PER LB (70% PRODUCER EFFICIENCY) (LBS COAL PER LB GLASS)	561	486	526	526	526	447	435	335	384	472	394	461	443
NATURAL GAS EQUIVALENT AT 1000 BTU PER CU FT (PER TON GLASS)	10335	8943	9680	9688	9679	8237	8009	6169	7066	8683	7249	8487	8148
FUEL OIL EQUIVALENT AT 150,000 BTU PER GALLON (PER TON GLASS)	68.9	59.6	64.5	64.5	64.5	54.9	53.4	41.1	47.1	57.9	48.33	56.58	54.32

NOTE: The tanks had a 45° slant throat on all campaigns. The ware manufactured was flint containers.

(1) Months of life calculated by dividing total days life by 30

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PFIZER

Manufacturing Chemists Since 1849

Chemical Economics

RICHARD F. WARREN, Market Editor

Outlook for First Quarter Is Good as Labor Strife Clears and Demand Remains High

While forecasting is generally a risky operation, most chemical executives seem to be optimistic on the outlook for chemical consumption in the first quarter of 1950. In spite of the fact that 1949 was the first year since the end of the war in which new chemical consumption records were not established, it was in general a good year. Competitive selling kept all chemical firms on their toes. Considerable labor trouble both in and out of the process industries hampered output, but most chemical consuming plants were able to get a steady flow of raw materials for their operations. There were exceptions. The recent steel and coal strikes were the heaviest blows that hit the CPI this year. Coal tar products were badly hit and late in November they were still scarce. However, for the week ending November 26 the iron and steel industry was operating at 78.2 percent of capacity —up 20 points from the preceding week. Since the coal chemical industry is tied closely to iron and steel operations through the demand for coke, this means a fast return to normal supplies of benzene, phenol, toluene and other coal chemicals.

An interesting sidelight on the increasing cost of coal may be seen in the recent bid of a pipeline firm to pipe natural gas from Ohio to Concord, N. H. The firm plans to supply 200,000,000 cu. ft. per day into New England if they get federal approval. For the twelve months ended September 30, natural gas sales to ultimate consumers have soared to 2,990,709 million cubic feet. This is 11.2 percent above the previous twelve months according to the American Gas Assn. During the same period, manufactured gas sales were off 3.5 percent to 431,-144 million cubic feet. A brief look at other sections of the chemical processing industries reflects the reasons for an optimistic viewpoint.

Pulp and paper industry, a large chemical user, is finishing up the year with a spurt. In November the paper and board plants were approaching record operating rates.

Rayon bounced back in September and October to a point where industry spokesmen felt that shipments for the year will be only 10 percent below 1948. W. H. Brown, American Viscose Corp.'s secretary and treasurer, recently pointed out that rayon more than held its own in a year in which major adjustments occured in textiles. Other synthetic fibers are also growing rapidly and a further growth is expected next year. Acrylonitrile-type fibers are creating a considerable stir in this branch of the process industries. In the next few years a very large growth is expected.

In contrast to rayon's 10 percent drop, cotton consumption is down an estimated 15 percent and wool is off 25 percent compared with 1949 rates.

In November the leather industry was also moving into a period of good demand. The demand for hides and skins resulted in a very firm price situation.

In the rubber industry a strike at Goodrich plants helped pull down rubber consumption to 75,503 long tons in September. A year ago consumption amounted to 90,000 long tons.

The petroleum industry has been watching the flood of oil on the market with mixed reactions. One school of thought wants to cut down on imported crudes to correct the situation. Some claim that eventually domestic crude may finally arrive at the secondary position of supplementing foreign crudes. The other side says that without imports the price of petroleum products will rise to the detriment of the American consumer.

Fertilizer spokesmen say that we will have more mixed fertilizers next year than we had in this crop year. Ray King, chairman of the board of the NFA, says that 1.5 million tons more mixed fertilizers will be available to the farmers next year. He also stated that there will be an additional 100,-000 tons of nitrogeneous top dressing available.

Synthetic detergents continued to set new records this year. L. H. Flett, president of the AIC, estimates an output of 1,000,000,000 lb. in 1949. This is 300,000,000 lb. above the 1948 level. At a recent meeting in Detroit he predicted that this total would rise to 3,000,000,000 lb. per year in ten years.

Potash supplies have dropped off as a result of the strike at all Carlsbad, N. M., potash operations in November. In November the plants, which produce about 85 percent of our potash, had an inventory that amounted to about 1 percent of the annual output. The U. S. Potash refinery had about two weeks stocks piled up at the unit. The net result will be a very tight supply situation in the next quarter.

Price Trends

Chemical prices continued their gradual downward movement in November. Pigments led the field. By December 1, the *Chemical Engineering* price index for chemicals had dipped to 121.16. This is more than nine points below the January 1949 price level for chemicals. In recent months, however, the trend line has flattened out, as most major readjustments in price seem to have taken place. Despite a definite easing in the supply situation, chemical prices in the industry appear to have reached a rather firm level.

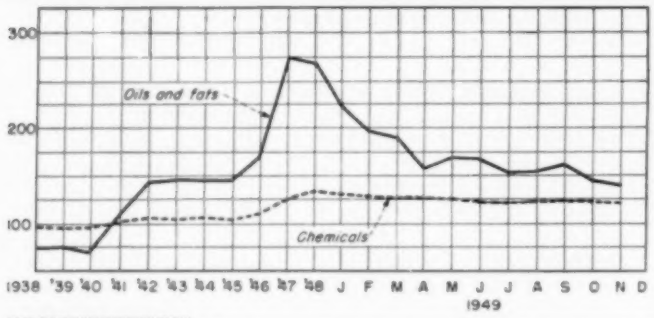
One of the major reasons for the soft price situation in pigments is the importation of considerable quantities of lead. Since the basic price of the metal has a direct influence on several pigments, it is only natural that they should come down in price as cheap foreign competitive metal hits the market here.

While no price changes in coal chemicals were reported recently, the amount of these products on the market was short of demand in November. With the return of a three-day week to the coal industry early in December, no great improvement in supply seems probable this year. However, early next year the supply-demand situation should be back to normal if Lewis and the mine operators can reach agreement on a new contract. A miner lost an average of $1,200 in pay this year due to strikes. This fact has weakened Lewis' position.

Early in December the naval stores industry was told that the government would support prices for the 1950 crop at 60 percent of parity instead of this year's 80 percent level.

PRICE, CONSUMPTION AND PRODUCTION TRENDS

PRICES

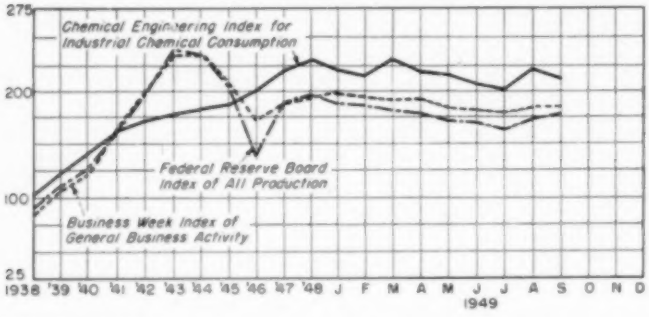


Chemical Engineering's Price Index
A month, a year, and two years ago.

	Chemicals	Oils & Fats
As of December 1	121.16	139.42
Last month	121.28	139.09
December 1948	132.23	246.09
December 1947	128.52	204.66

1937 = 100

CONSUMPTION

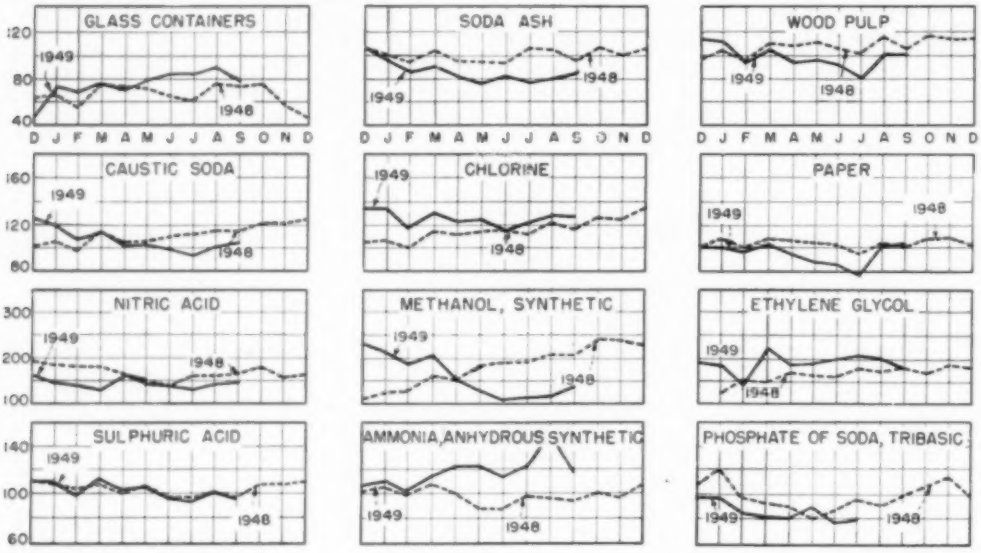

275
200
100
25
Chemical Engineering Index for Industrial Chemical Consumption
Federal Reserve Board Index of All Production
Business Week Index of General Business Activity
1938 '39 '40 '41 '42 '43 '44 '45 '46 '47 '48 J F M A M J J A S O N D
1949

Chemical Engineering's Consumption Index for Industrial Chemicals
(A breakdown by consuming industries)

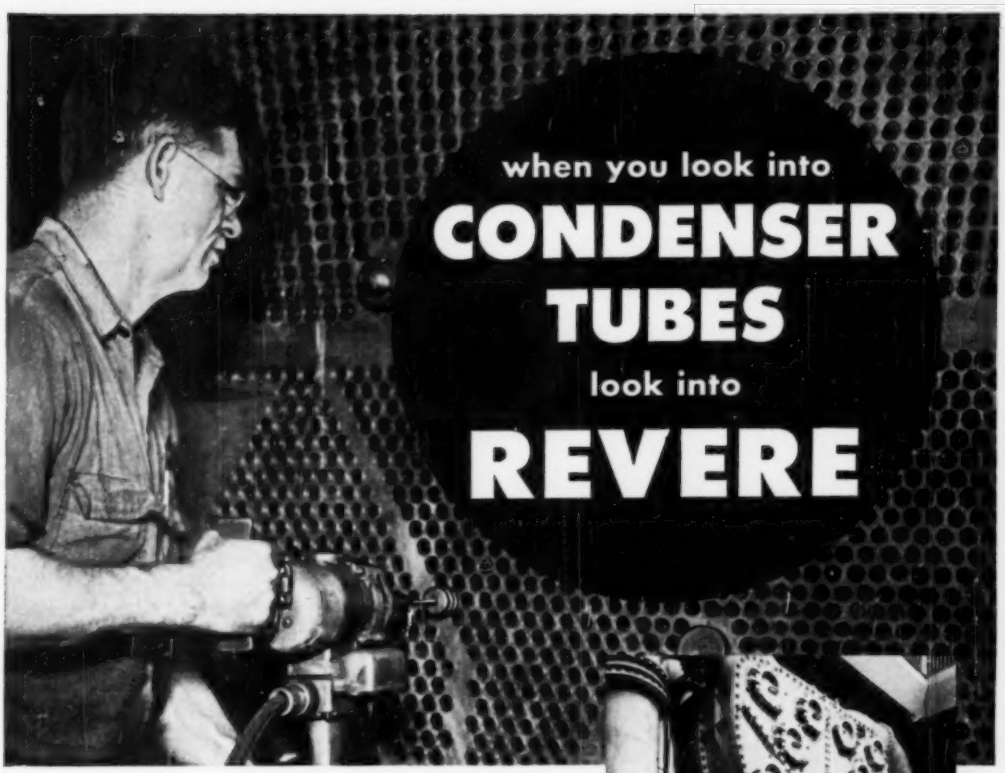
	August (Revised)	September
Fertilizers	52.70	48.00
Pulp and paper	22.55	23.20
Petroleum refining	22.35	21.15
Glass	18.80	17.55
Paint and varnish	24.30	23.41
Iron and steel	12.21	12.10
Rayon	22.38	22.70
Textiles	9.50	9.68
Coal products	9.89	7.10
Leather	4.41	4.42
Explosives	7.80	7.14
Rubber	4.53	4.38
Plastics	9.66	10.35
INDEX	222.28	211.18

1935 = 100

PRODUCTION



100=Monthly Average 1947



. . . and be assured of Top Performance

Because each condenser installation presents an individual combination of conditions, it is not possible to recommend any one alloy that will give complete satisfaction under all operating conditions.

For example: in the condensers (shown above) being made by the Elliott Co. of Jeannette, Pa. for the Ohio Edison Company, the tubes are Revere Admiralty Metal, inhibited to resist dezincification. This metal also is highly resistant to other forms of attack. The result is a set of condenser tubes that are best suited to the operating conditions of this particular installation.

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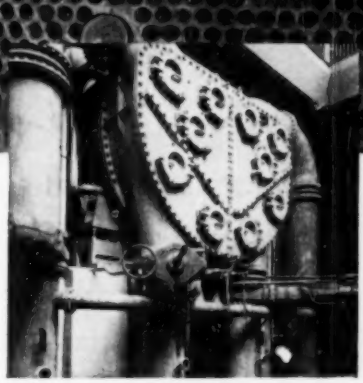
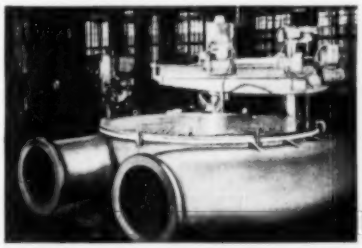
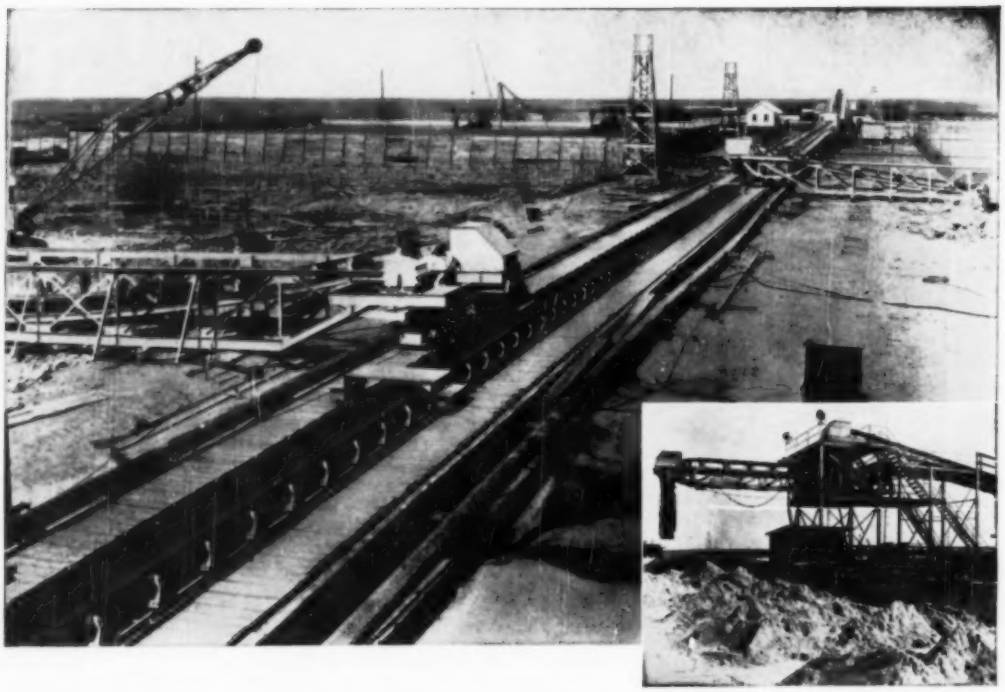


View of condenser built by the Elliott Co. for the Mad River Station of the Ohio Edison Co., Springfield, Ohio. It is an 18,200 sq. ft. two-pass divided water-box type, equipped with 3480 1" O.D. x #18 B.W.G. x 20' 3" long Arsenical Admiralty Revere Tubes.



TUBE PLATE OF REVERE MUNTZ METAL for an 11,000 sq. ft. surface condenser, to be installed for a Texas utility, being drilled in the shops of the Elliott Co., at Jeannette, Pa.



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Commodity Survey:

MONOSODIUM GLUTAMATE

Robert S. Aries and William Copulsky

Monosodium glutamate, MSG, is a white crystalline salt which has no taste of its own. Yet, when added to food, it intensifies flavor by sensitizing the taste buds of the mouth. MSG is also capable of suppressing certain undesirable flavors. It can be used with meat and vegetable products, but generally not with dairy products.

MSG was used in crude form by the Chinese for many centuries. It occurs naturally in some seaweed, and this ground seaweed was sprinkled on food. The bland and monotonous oriental food rapidly created a demand for it, so that prior to the war, the Japanese Suzuki & Co., produced as much as 6 to 8 million pounds per year under the name "Aji-No-Moto" meaning "Essence of taste."

The raw material for MSG is gluten, a protein found in wheat, soybeans, and the waste from beet sugar production. The Japanese made it from wheat and soybeans. China had a small production, but the plant was destroyed in 1937.

Imports—Before the last war, imports accounted for about one-third of total consumption, and came principally from Japan. Prewar imports were about one-half million pounds yearly. United States production during the prewar period was 1 to 1.5 million pounds yearly. Increased domestic production and destruction of foreign facilities will probably prevent substantial imports for some time to come.

At the present time Japanese production is estimated at only about one-half million pounds per year.

Production—Total domestic production of MSG in 1948 was 6.2 million pounds. Nearly all of it was sold at an average value of $1.55 per lb. Four companies produce MSG. The Huron Milling Co., Harbor Beach, Mich. produces about 2.5 million pounds yearly. The International Minerals & Chemicals Co., Rossford, Ohio and San Jose, Calif., produces almost 3.5 million pounds per year. General Mills, Inc., Keokuk, Iowa produces about 1 million pounds per year, mainly for its own use in dehydrated soups. A. E. Staley, Decatur, Ill., produces about 1 million pounds per year.

The California plant of International Minerals uses Steffens waste from beet sugar production as a raw material. Staley uses corn gluten. The other plants start with wheat gluten. Staley has planned to use soy protein as a raw material, but reportedly has not done so successfully.

While wheat gluten seems to be the best raw material, wheat starch is a byproduct, and the market for this starch is now limited. For this reason other raw materials are being sought, especially where byproducts can be easily sold.

The total capacity of established plants is about 12.5 million pounds, which appears sufficient to meet demand at the present time.

Uses—About 2 million pounds goes to canned soup, the same amount to canned meat products, and about 1 million pounds each to dry soup mixes, and to restaurants. A smaller amount is sold directly to the consumer for table use. The marketing of these consumer-size retail packages is still experimental.

The industrial markets are probably not far from saturation at today's levels of business activity. The retail market has a great potential. The Japanese sold 9 million pounds yearly to a population of about 70 million.

An effective aid to increased use is a recent decision of the Federal Food and Drug Administration that MSG is not an artificial flavoring, and does not have to be labeled as such.

Substitutes—To a slight extent hydrolyzed proteins substitute for MSG. But mixed hydrolyzed proteins are usually not uniform in quality and tend to have a definite taste of their own. About 2 to 4 million pounds of such materials are sold yearly, mainly for use in strong tasting products where their own taste will be masked. In some cases they are used to impart a meat-like flavor where this is desirable, especially where meat is forbidden for religious or medical reasons.

Prices—The prewar price of MSG was about 75c. to $1 per lb. in large quantities. The present bulk price is closer to $1.50 to $1.60 per lb., depending on source and quantity purchased.

Raw Materials—Gluten, the principal raw material for MSG, is a protein derived from various grains. Starch is a byproduct, and the conversion or marketing of this starch is a problem to both MSG and gluten producers. In addition to companies producing gluten for their own use in making MSG, one company, Trenton Chemical Co., Trenton, Mich., produces large amounts of gluten for sale as an MSG raw material. The wheat starch obtained is fermented to neutral spirits for the distilled liquor industry. Another company has also entered the market recently on a smaller scale.

The Japanese have been able to successfully use soybean gluten. The deproteinized meal finds a more ready market than does starch. They have even produced MSG from fish and fish wastes. Actually gluten naturally occurs in a wide variety of materials including wheat, corn, peanuts, soybeans, rice, eggs and yeast, but the wheat has the highest content, and gives least difficulties in production.

Future—MSG production can be expected to expand greatly, both here and in foreign countries, once the product is accepted for home use. High price is an important deterrent. An eventual bulk price of $1 per lb. has often been suggested. The ability of manufacturers to meet this price, depends on raw material problems, and consumer acceptance of MSG as a commonplace addition to the home table.

End Use Pattern

Product	Estimated Consumption (million pounds)
Canned soup	2+
Canned meats, stews, bouillon cubes, and specialty meat products	2+
Dry soup mixes	1+
Restaurant specialties	1+
Household seasoning specialties	?
Annual total	7+

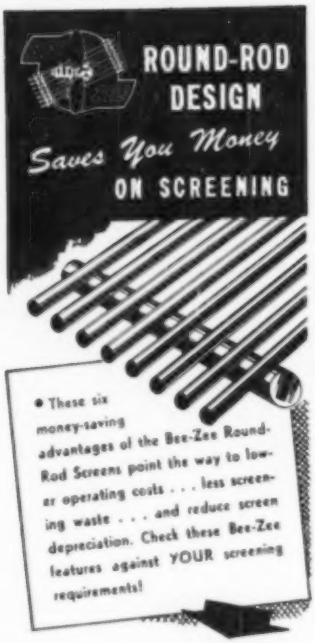
This paper is a summary of an investigation of the manufacture, economics and utilization of MSG.

Production capacities have tripled since the war ended.

(millions of pounds)

Producers	Started	Plant	Production: Pre-War	Production: War	Production: Present	Capacity
Huron Milling Co.	1934	Harbor Beach, Mich.	1.5	2.4	2.7	3
International Minerals & Chemicals Corp.	1936	Rossford, Ohio	0.75–1.2	1.0	?	3
	1947	San Jose, Calif.	..	..	3.4	4
General Mills, Inc.	1945	Keokuk, Iowa	..	0.45	1.0	1
A. E. Staley Mfg. Co.	1948	Decatur, Ill.	..	..	0.5	1.5
		Annual Total	2.3–2.7	3.9	7.6	12.5

ROBERT S. ARIES *is president of R. S. Aries & Associates, Brooklyn, N. Y.* WILLIAM COPULSKY *is also a member of the firm.*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United States Production of Certain Chemicals

Chemical (Tons unless otherwise noted)	August 1949	August 1948	July 1949	July 1949
Ammonia, synthetic, anhydrous[1]	113,930	85,856	109,505	99,442
Ammonium nitrate	82,320	79,233	80,609	76,651
Ammonium sulphate, synthetic (M lb.)	61,646	14,345	58,980	27,456
Calcium arsenate (M lb.)	2,960	800	3,070	3,373
Calcium carbide, commercial	41,654	37,445	44,227	39,378
Carbon dioxide:				
Liquid and gas (M lb.)	28,913	26,906	28,709	26,781
Solid (M lb.)	108,383	93,088	104,433	92,036
Chlorine	147,325	142,412	139,163	129,445
Chrome green (M lb.)	964	1,057	890	1,018
Chrome yellow and orange, (C.P.) (M lb.)	2,982	3,403	2,988	3,474
Hydrochloric acid	30,770	35,782	35,978	32,620
Hydrogen (M cu. ft.)	2,270	2,403	2,987	2,148
Lead arsenate, acid and basic (M lb.)				506
Molybdate chrome orange, (C.P.) (M lb.)	430	334	344	373
Nitric acid	93,308	90,318	90,382	92,504
Oxygen (M cu. ft.)	1,184	1,328	1,042	1,205
Phosphoric acid (80 percent H_3PO_4)	100,949	102,961	103,323	98,964
Soda ash:				
Ammonia-soda process:				
Total wet and dry[2]	386,460	394,215	289,943	398,871
Finished light[2]	180,930	206,857	144,375	202,631
Finished dense	111,397	127,004	109,026	133,921
Natural[3]	16,643	29,571	17,939	28,755
Sodium bicarbonate, refined	14,334	13,933	10,446	13,906
Sodium bichromate and chromate	5,875	7,780	4,039	7,600
Sodium hydroxide:				
Electrolytic process				
Liquid[4]	133,373	138,624	124,624	136,720
Solid	20,150	29,985	18,916	27,984
Lime-soda process				
Liquid[4]	42,580	64,850	39,054	67,292
Solid	11,182	22,858	9,922	21,649
Sodium phosphate:				
Monobasic	964	1,009	872	744
Dibasic	10,578	8,011	8,757	1,015
Dibasic	6,332	6,172	5,372	6,529
Tribasic	1,941	2,905	1,940	2,712
Meta	4,879	5,023	4,837	4,423
Tetra	29,294	30,085	26,446	28,230
Sodium silicate, anhydrous				
Sodium sulphate:				
Anhydrous	9,477	15,257	7,502	12,671
Glauber's salt[5]	12,702	14,680	7,522	13,241
Salt cake[6]	46,032	52,613	34,654	50,942
Sulphuric acid[7]				
Chamber process	210,122	228,491	198,497	211,110
Contact process, 100%	590,040	600,436	578,893	571,231

Data for this tabulation have been taken from "Facts for Industry" series issued by Bureau of the Census. Production figures represent primary production and do not include purchased or transferred materials. Quantities produced by government-owned arsenals, ordnance works, and certain plants operated for the government by private industry are not included. Chemicals manufactured by TVA, however, are included. All tons are 2,000 lb. Where no figures are given data are either confidential or not yet available. [1]Includes a small amount of aqua ammonia. [2]Total wet and dry production, including quantities diverted for manufacture of caustic soda and sodium bicarbonate, and quantities processed to finished light and finished dense. [3]Not including quantities converted to finished dense. [4]Data collected in cooperation with the Bureau of Mines. [5]Figures represent total production of liquid materials, including quantities evaporated to solid caustic and reported as such. [6]Includes oleum grades, excludes spent acid. [7]Data for sulphuric acid manufactured as a byproduct of smelting operations are included.

United States Production of Synthetic Organic Chemicals

Chemical	August 1949	August 1948	July 1949	July 1949
Acetanilid	286,621	...	339,196	415,675
Acetic acid:				
Synthetic[1]	29,957,407	29,323,834	28,143,039	35,368,572
Recovered	117,720,705	152,186,343	86,328,077	143,504,327
Natural[2]	1,680,294	2,391,867	1,554,548	2,376,123
Acetic anhydride[3]	50,784,336	63,003,940	40,527,804	63,245,936
Acetone	27,208,870	36,588,682	25,654,618	40,232,737
Acetylsalicylic acid	907,528	904,564	250,386	249,396
Aniline	4,143,851	7,396,800	5,467,451	7,242,535

(Continued on page 288)

Penberthy Ejectors

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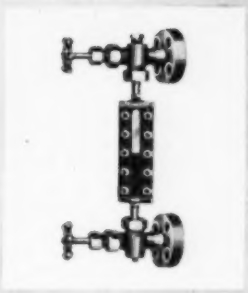

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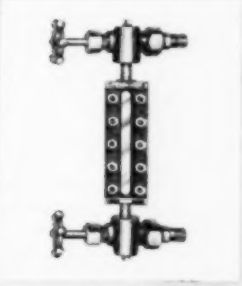

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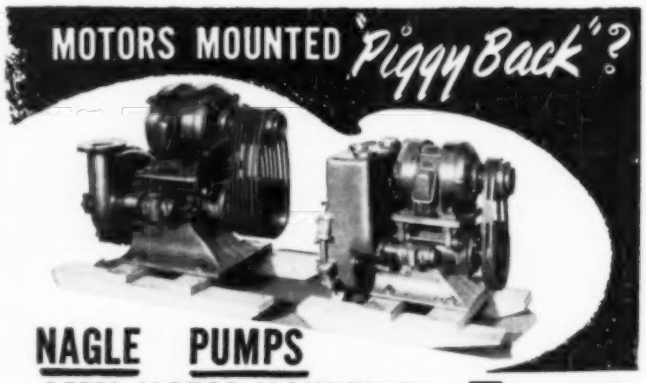
United States Production of Synthetic Organic Chemicals, cont. from page 286

Chemical	August 1949	August 1948	July 1949	July 1948
Barbituric acid derivatives[5]				
5-Ethyl-5-phenylbarbituric acid and salts (phenobarbital)		12,736	23,080	25,963
Benzene:				
Motor grade:				
Coke oven operators[6]	1,148,280	703,793	1,345,715	750,567
All other grades:				
Tar distillers[4]	880,226	831,195	463,899	928,719
Coke oven operators[6]	10,524,880	11,872,577	9,340,513	11,792,858
Butyl alcohol, primary, normal	10,127,586	11,089,655	10,669,417	11,636,009
Carbon bisulphide	28,210,999	33,399,130	27,939,702	29,528,866
Carbon tetrachloride	16,813,520	17,798,101	14,020,181	14,008,277
Chlorobenzene, mono	14,684,340	25,420,732	14,468,726	8,079,403
Creosote oil:				
Tar distillers[4]	8,704,103	9,527,654	9,017,431	8,958,149
Coke oven operators[6]	1,391,186	2,402,674	1,524,128	2,386,709
Cresols, m-cresols-para	482,047	640,143	342,129	868,442
Cresols, ortho-meta-para		873,307	346,402	794,129
Cresylic acid, refined[7, 8]	1,963,240	2,484,541	1,336,799	2,599,285
Dibutyl phthalate		1,187,189	883,700	1,564,257
Dichlorodiphenyltrichloroethane (DDT)	3,922,676	720,709	3,566,986	332,600
Ethyl acetate (85 percent)	6,423,608	5,457,116	5,798,266	4,972,103
Ethylene glycol	38,013,457	33,496,440	38,598,853	30,140,226
Ethyl ether	2,232,020	3,089,766	2,279,843	2,363,709
Formaldehyde, 37 percent by wt.	43,452,328	45,775,954	39,468,709	45,658,213
Hexachlorocyclohexane	2,988,302	650,005	2,193,385	936,083
Methanol, natural	1,043,436	1,202,509	902,947	1,417,713
Methanol, synthetic	53,813,163	94,604,605	50,322,985	99,691,588
Naphthalene:				
Tar distillers, less than 79° C.	10,682,742	18,228,160	8,265,555	16,423,232
Tar distillers, 79° C. and over	4,276,096	6,149,598	2,339,534	8,201,504
Coke-oven operators, less than 79° C.	5,220,346	8,346,173	4,872,061	7,898,409
Penicillin and salts[9]	9,915,386	7,379,317	9,983,106	9,485,947
Phenol	13,966,298	25,068,805	11,356,999	15,177,809
Phthalic anhydride	10,103,338	11,367,426	7,104,019	12,132,980
Styrene, government and private plant	34,926,460	34,442,940	28,763,246	24,939,959
Toluene:				
Coke-oven operators	2,388,810	2,410,169	2,316,521	2,382,468
All other[10]	3,025,192	3,365,763	2,439,804	2,458,053
Xylene, crude	4,495,014	5,494,709	3,145,712	4,992,399

All data in pounds except benzene (gal.) creosote oil (gal.), toluene (gal.) xylene (gal.) and penicillin (million Oxford units). Statistics collected and compiled by U. S. Tariff Commission except where noted. Absence of data on production indicates either that returns were unavailable or confidential. [1]Excludes the statistics on recovered acid. [2]Acid produced by direct process from wood and from calcium acetate. [3]All acetic anhydride including that from acetic by vapor-phase process. [4]Product of distillers who use purchased coal tar only or from oil-gas or water-gas produced or purchased by tar distillers. [5]Statistics are given in terms of bulk medicinals only. [6]Statistics collected by Bureau of Mines. [7]Total production including data reported both by coke-oven operators and by distillers of purchased coal tar. [8]Reported to U. S. Bureau of the Census. [9]Includes toluene produced from petroleum by any process. [10]Includes refined cresylic acid from petroleum.



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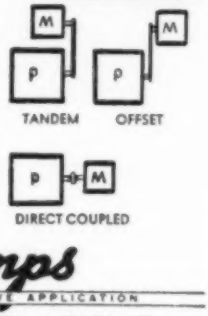

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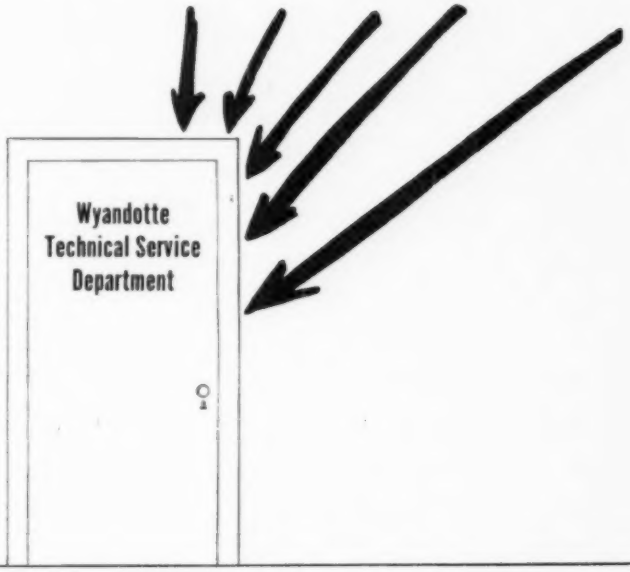

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the condition that E3 must be empty before starting another batch is also effectively built in to the circuit.

The satisfactory completion of the urea check in E2 results in the transmission of the relayed signal from tap "5" of C4, via C27, to the engaging section of the solenoid member of the mechanically held relay C18. This applies phase to the phase tap of the level switch C19. Since E3 would be empty, applying phase to the phase tap of C19 results in the emission of an "empty" signal from tap "3" of C19 for a period beginning when phase is applied, and ending with the immersion of the probe "H" in E3. The emitted signal from tap "3" of C19 is then applied simultaneously to the actuating solenoid and the load contacts of the timing relay C47. This timing relay is of the "on-delay" type, and serves the function of preventing an unscheduled charging of E3 after the contents of E3 are exhausted to E7. At the expiration of the delay period of C47, the relaying of the signal from tap "3" of C19 to the phase side of the normally closed solenoid valve V1 results in the gravity feed of formaldehyde to E3 until the probe "H" is immersed. This means the charging of E3 with enough formaldehyde for one-third capacity production.

UREA CHARGING

The next task is the charging of the proper quantity of urea crystals into E3. The principal components of the interlock train accomplishing this are the timer C40 and the constant-rate vibratory feeder operated by the electronic controller C36.

The timer C40 not only controls the quantity of urea fed to E3, but also controls other subsequent operations in E3. It is of the type allowing a multiplicity of operations to be individually controlled through the various adjustable load contacts of the timer. The "on" period of the contacts between taps "4" and "5" of C40, combined with the engagement of the relay C41, results in the switching on of the load circuit of the vibratory urea feeder for a feed time required for one-third capacity operation of E3. The "on" period of the load contacts between the taps "6" and "7" of C40, combined with the engagement of the relay C42, results in feeding sufficient urea to E3 for two-thirds capacity production. The "on" period between the load contacts of the taps "8" and "9" of C40, combined with the engagement of the relay C43, results in adding urea for the full capacity operation of E3.

The urea feeder consists of an electromagnet-motivated feeder bin and feeder trough, in which the electromagnets are operated by unfiltered, pulsating d.c. current supplied by a rectifier unit. This feeder has a constant rate feeding characteristic, once its rectifier tubes have been brought to thermal equilibrium. A delay of approximately 20 sec. in switching on the load circuits of the feeder-controller C36 is required for the filament circuit of the controller to heat.

The main condition that must be met in the urea feeding operation is that it should commence only after the proper charge of formaldehyde has been added to E3. Simultaneous addition of urea and formaldehyde would obviously complicate the problem of feeding of the formaldehyde.

This condition is satisfied by making the signal from tap "5" of C19 the prime signal for starting the urea feeding operation. A phase signal appears at tap "5" of C19 only after a proper supply of formaldehyde has been added to E3. This signal is simultaneously applied to the solenoid member and the load contacts of the "on-delay" timing relay C37. During the delay period of C37, which is in fact the period required for the filament circuit of the controller C36 to come to thermal equilibrium, phase supplied from tap "5" of C19 is applied to the filament circuit of C36. Switching on the load circuit of the vibratory controller C36 is managed through coordinated working of the timer C40 and any one of the three relays: C41, C42, or C43. Upon conclusion of the heat-up period for the filament circuit of C36, the engagement of the load contacts of C37 results in the transmission of the phase signal applied to the solenoid member of C37 to the solenoid member of the relay C39. The resultant engagement of C39 sets C40 into its timing cycle.

If the master switch C1 is in its "one-third capacity" position, C41 is closed and the starting up of the timer results in the phase signal from tap "5" of C40 being transmitted to the load circuit of the vibrator C36, and also to the heater circuit through relay C38, thus placing the urea feed under the control of the timer C40.

INITIATION OF FIRST REACTION

The next demand on the interlock system is for the coordination and sequencing of the operations involved in carrying out of the reaction in E3. These operations consist chiefly in: (1) starting and maintaining agitation of the reaction mass during the period of the reaction; (2) applying pH control for the duration of the reaction; and (3) applying temperature control during the reaction.

In order that the urea crystals will be dissolved as rapidly as possible, agitation must be scheduled to begin before commencement of the reaction in E3. Accordingly, the "on" period of the contacts between taps "10" and "11" of C40, which controls the motor starter of the agitator assembly on E3 through the relay C44, is set to commence simultaneously with the beginning of urea feed to E3. It continues until the completion of the reaction in E3. To take care of the negative heat-of-solution of urea, steam flow to the jacket of E3 is necessary during dissolution, in order to have a proper temperature at the end of the dissolution for starting the reaction. The simultaneous application of phase supply to the temperature instrument C45 and its associated relay C46, from the same source of phase supply as is used for C44, means that temperature control over the contents of E3, and its agitation, occur for the same period of time.

The temperature instrument C45 is of the three-wire, all-electrical type which may be depended on to yield a response accuracy of at least 3 percent of range. The facts that the reaction in E3 is not critically sensitive to temperature, and that for most of the cycle a simple flow of water through the jacket suffices, makes this instrument an adequate one for the application. In view of its load-carrying capacity, C45 utilizes the thermostatic relay C46 for the operation of valve pairs V3-V5 and V2-V4, for alternatively applying steam or water to the jacket of E3.

Thus, it will be seen that with the expiration of the urea addition cycle, the urea will be fully dissolved in the formaldehyde and the resultant batch will be at the temperature designated by C45.

When all the urea has been added and dissolved, the mass in E3 is ready for the reaction and the commencement of pH control. Urea, being a fundamentally alkaline material, changes the pH of the mass in E3 progressively as it is being added. It is therefore necessary to withhold the operation of the pH control train until all the urea is dissolved. This pH control train consists of the pumps P1 and P2, and the pH controller C200, with its associated three-way air-feed valve V37.

P1 is a recycle pump by which the

mass in E3 is continuously sampled and delivered to an outside pH control chamber. P2 maintains the head of caustic soda necessary to effect its delivery simultaneously to the pH chamber and to E3, directly through the mechanical proportioning device C300, whenever caustic soda is required for maintaining the required pH. The pH controller C200 consists of a Beckman pH instrument, the output of which is amplified by an electronic amplifier. The amplified signal is delivered to an indicator which is also associated with a typical throttling, automatic-reset, derivative-action pneumatic controller mechanism. The delivery of supply air via the three-way valve V37 to the pneumatic controller portion of C200, and the parallel energizing of the electrical members of C200, is the method of applying the control of the pH train to the contents of E3.

To insure that pH control is maintained for the entire period of the reaction in E3, beginning with the completion of the urea addition, the controlling signal for the operation of C200 and V37 is taken from tap "10" of the timer C40. This tap, however, is live for the entire period beginning with the initiation of urea addition. Since we do not want pH control to begin until after the urea addition, the relay C94 (which is energized when vibrator C36 is operating) is interposed to interrupt the signal during urea addition. Thus, pH control is delayed until the completion of urea addition, whatever the batch size.

The functions served by the rest of the interlock system associated with the performance of E3 are: (1) the signalling of the completion of the reaction period in E3, and the signalling into operation of E7 to convert the material prepared in E3 to finished urea-formaldehyde resin solution; and (2) the resetting of the interlock system for the next operation of E3.

Signalling of the completion of the reaction period in E3, and the various functions connected with this, is carried out by the contacts between taps "12" and "13" of C40, which close for a brief period before the end of the timer clock cycle. The signal emitted from tap "12" of C40 is applied to the mechanically held relays C35 and C51.

The consequent engagement of C35 energizes the motor component of the level device in E2, as well as the relay C95. The energizing of C95 isolates the solenoid C14 from the rest of the circuit, at the same time energizing it, and releasing the brake on the drum of the level device. The motor therefore winds back the rope. When the weight rises to its reset position, it trips the limit switch C34, stopping the motor and reversing C35. This makes the level device ready for its next operation.

The signal from tap "12" of C40 engages C51, thus signalling the operations by which the prepared batch in E3 is further processed in E7.

The readying of the E3 interlock system for a repeated operation of this vessel follows from the emission of an "empty" signal from tap "3" of C19. That is to say that the interlock system associated with E3 is reset after the contents of E3 has been completely discharged to E7. The resetting of the interlock system corresponds to the disengaging of C2, C51, and C18. In addition, it is necessary to reset C17 or C23 or C27, depending on the size of batch in E3 which was previously prepared. The qualifications which must be met in following this general scheme of operation are that: (1) an unscheduled performance of the valve V1 must be prevented; and (2) the signal from tap "3" of C19 must survive the disengaging of all of the other mentioned relays, while C51 must be disengaged just slightly ahead of the discontinuation of phase feed to C19.

Upon the discharge of the last feed from E3 to E7, the accompanying signal from tap "3" of C19 is relayed directly from one of the load contacts of C51 to the disengaging sections of the mechanically held relays C2, and C17 or C23 or C27. After a short delay, C52 closes, transmitting the disconnect signal to C51 and applying a phase signal to C18, thus disengaging C51 and C18. This results in stopping phase feed to C19, and also in the de-energizing of C52. It will thus be seen that the empty signal from C19 lasts only for a very short interval, just enough to reset the interlocks. The "on-delay" period of C47 is made longer than this interval, so that even though the short "empty" signal may energize the coil of C47, before the relay has time to close, the signal is extinguished, thus insuring that no spurious response of valve V1 will be caused. Thus, the system is made ready for the next cycle.

POLYCONDENSATION REACTION

By this time the reader will have become familiar with the use of Table II in following the interlock system, and will have no trouble applying the table to the operation of the reactor E7. Therefore, we will devote the remainder of this article to describing the more instructive phases of the interlock system associated with E7.

The first of these features is that which supervises the proper supply of caustic soda in E4 and acetic acid in E7, so that the pH control system will have sufficient raw materials. The prime condition in carrying out the polycondensation reaction in E7 is absolute control over the pH of the reaction mass during all portions of the reaction cycle. The level switches C55 and C56 associated with E4 and E6 respectively, together with the relays C54 and C57, carry out this task.

Signaling of a transfer operation from E3 to E7 involves the simultaneous application of a phase signal from the load contacts of C53 or C51 to the phase tap of C55, the solenoid of C54 and the load contacts of C54. The probe "J" in E4, which is connected to the "high" tap of C55, is located at such a level that it corresponds not only to a full day's cycling of E7, but to the caustic requirements of a new batch of material from E3 as well. The probe "L" in E6, which is connected to the "high" tap of the level switch C56, is set at such a level that it corresponds at least to a full day's production capacity of E7.

With the application of the phase signal to C55 and C54, the signal applied to the solenoid and the load contacts of C54 is transmitted across C54 to energize C57 for the period of "on-delay" for which the timing relay C54 is set. By thus accounting for the disassociation of the "low" tap of C55 from probe "K" and C56 from probe "L", C55 and C56 are forced to respond as single-level detectors for the duration of the "on-delay" period of C54. If the specified levels of caustic soda in E4 and acetic acid in E6 are present, phase is emitted from tap "5" of C55 and is relayed across C103 to the phase tap of C56. The emission of phase from tap "5" of C56 would then provide for applying phase to the phase tap of C58. By reason of the transmission of the "empty" signal from tap "3" of C58 across C59, this energizes the normally closed solenoid valve V6 so that a batch of material is delivered from E3 to E7. If there is not a proper level of caustic soda in E4, the emission of a signal from tap "3" of C55 will give audible and visual signals of this condition via C101 and C102, while providing for a test signal to C56 via the energized relay C103, at the same time isolating C58 from C56. An inadequate supply of acetic acid in E6 is signalled to the attendant via C104 and C105.

Should the level in either or both of E4 and E6 be less than that required for operating E7, the eventual expiration of the delay period of C56 and the consequent de-energizing of C57 will not restore the continuity of

the signal from the phase tap of C55 to the phase tap of C58. This is because only a filling of the depleted chamber can restore the necessary continuity of signal advance. Thus, it is impossible for E7 to go into its cycle of operations without the necessary supplies of caustic soda and acetic acid in E4 and E6 being in readiness.

A glance at the schedule of operations for E7 will disclose that the proper execution of the condensation reaction in E7 is dependent upon an unusual co-ordination of pH and temperature conditions.

To the extent that this is possible, let us attempt to single out the unusual conditions imposed by a varying pH-time schedule. Adjustments of the pH towards the acid side in E7 are managed through the addition of glacial acetic acid from E6, while adjustments towards the alkaline side are managed through the addition of caustic soda solution from E4. In either case, the instantaneous evaluation of the pH of the reaction mass, and the continuous adjustment of the existing pH condition, come from the continuous sampling of the contents of E7 in the external mixing and sampling chamber E8. Pump P4 is used for continuously sampling E7. The actual correction of the pH of the mass in E7 involves delivery of proportioned streams from the mechanical ratio-controling devices C301 or C302 to E8, and also directly to the mass in E7. It will be seen readily that the exact control of the pH demanded by this reaction, as well as the wide range over which the necessary pH control extends, imposes the requirements that: (1) the pH controller C201 must be capable of shuttling its control sensitively from control over acid feed, to control over caustic feed, and vice-versa; and (2) the lines downstream from the ratio controling devices to E8 must be purged when C201 is made to shuttle.

The task of automatically carrying out the desired pH-time schedule is accomplished by the pH controller C201, which has the same basic characteristics as C200 except that means are provided for shifting the pH control arm with time. This shift is accomplished by a synchronous clock-driven internal cam, cut to fulfill the desired pH-time relationship, and thus to fix the control point at the desired level for each instant in the cycle. To carry out the instructions of this pH-time programmer, it is necessary to provide a shuttling train whereby C201 may, as necessary, shift from control over caustic soda feed to control over acetic acid feed, and vice versa.

This shuttling train contains the components C62, C64, C65, C63 and valves V39, V11, V26, V40 and V41. C201 is specified to have the characteristic of a declining control air pressure as the indicating arm approaches the control arm from the alkaline side. The instrument is adjusted to give a control air pressure of 1 psig. at coincidence between the indicating and the control arms. Therefore, if the cam produces a shift of the control arm of C201 toward the alkaline side, this means a decline in the pressure of the control air output of C201 to 0 psig. At this control air pressure, the normally closed pneumatic valve V17 will, for all practical purposes, be shut. Simultaneously, the double-pole, double-throw pressure switch C62, which is set to reverse at 1 psig., will be reversed. The delivery of phase by the normally open set of contacts of C62 which would then result, produces an application of power to the solenoid member and load contacts of the "on-delay" timing relay C65. For the delay period of C65, the valves V11 and V26 will be energized to flush the acetic acid contained in the line between these two valves. With the expiration of the delay period of C65, the applied signal from C62 to C65 will be transmitted to the pneumatic pressure switch C63. Since C63 is closed at pressures below 1 psig., the signal will be delivered to the normally closed solenoid valves V41 and V40. V41 then permits the pressure-to-close pneumatic valve V16 to exercise its control over caustic soda flow, while the three-way valve V40 then provides for the delivery of control air from C201 to V16.

This explains how the control of C201 is shuttled to control over the caustic soda, to adjust the pH in E7.

If, now, the operating cam of C201 sends the control arm past the indicator arm to the acid side, a sharp increase results in the delivered control air pressure from C201. The pressure switch C63, which is located downstream from V40 in the control air line to V16, opens and thus closes V40 and V41. Simultaneously, the pressure switch C62, which is located upstream from valve V39, is restored to its normal position due to the increase in the delivered control air pressure. Accordingly, the delivery of phase by the normally closed set of contacts of C62 results in the simultaneous application of power to the solenoid member and the load contacts of the "on-delay" timing relay C64. For the duration of the delay period of C64, phase is delivered to solenoid valves V11 and V26 to flush the line between these two valves of caustic soda solution. With the expiration of the delay period of C64, phase is applied to the three-way solenoid valve V39, so that control air from C201 is then delivered to the pneumatic top of V17.

This explains how the shuttling of C201's control from control over caustic soda feed, to control over acid feed, is accomplished.

Use of the timing relay components of the shuttling train just described not only provides for the necessary flushing of the line between valve V11 and V26 between shuttle operations, but it also gives the shuttling train a certain stability against oversensitive shuttling.

The problem of the sensitive temperature-pH coordination involved here is illustrated in the necessity for conducting the bulk of the pH adjustment under Item II-B, while the reaction mass is at room temperature, and also in the necessity for adopting temperature corrective measures in connection with Item II-E if the desired pH is not attained before the normal commencement of the vacuum dehydration operation in II-F. The need for a special pH-temperature coordination comes from the high velocity of the polycondensation reaction at elevated temperatures at almost any acid pH, and from the extreme response of the velocity of the polycondensation to pH variation.

Accomplishing the desired coordination between II-B and II-C involves that portion of the interlock system which contains C67, C68, C97, C70 and C96. At a point on the path of travel of the internal cam member of C201, corresponding to the normal attainment of the desired pH before the heating cycle in II-C is initiated, the cam member of C201 actuates limit switch C67 to apply phase simultaneously to the solenoid member and load contacts of C70, and also to the series members C68 and C97. The application of phase to the "on-delay" relay C70 results in the applying of a short duration pulse signal for the engagement of C96 which, in turn, leads to the interruption of the synchronous clock drive of the internal cam member of C201. The method of interruption is such that the limit switch C67 remains in its closed position for the duration of the interruption. The pneumatic switches C68 and C97, located in the control air delivery from C201, are such that, in the case of C68, an air pressure greater than a given limit will result in opening its contacts and, in the case of C97, an air pressure less

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than a given limit will result in opening its contacts. C68 and C97 are set to permit a given plus or minus variation in pH about the desired pH value. Thus, if the pH lies within the allowable tolerance about a pH value of 4.8, the phase signal from the downstream side of C61 is advanced to the downstream side of C97, where it acts to engage C69.

By engaging C69, phase is applied to the synchronous clock member of C202 and the three-way valve V42. Simultaneously, the engaging of C69 results in the application of a reversing signal to C96, thus opening the way for the continuation of the clock cycle of C201. Thus it will be seen that the interlock system enforces the needed processing relationship between II-B and II-C.

The coordination between II-E and II-F is achieved by that section of the interlock system in which C76, C78, C77 and C79 appear. Before describing this section of the interlock system, however, it is necessary to describe C202. C202 is a pneumatic-throttling-type automatic-reset, derivative-action temperature controller with an internal programmer cam arrangement similar to that of the pH controller C201. It is capable of establishing the desired time-temperature schedule for E7.

Setting C202 into action, as was observed previously, follows from the engaging of C69. It starts the heating cycle II-C. At a point on the temperature programming cycle corresponding to the end of the refluxing in II-D, the cam member of C202 trips the limit switch C78 to engage C77. From the engagement of C77 there immediately follows: (1) temporary interruption of the control of C202 over temperature conditions in E7 via the engagement of C66 by a signal delivered from one of the load contacts of C77; and (2) commencement of water flow in the jacket of E7 which is independent of C202, via delivery of a phase signal across the normally closed set of contacts of C79 and thence to the normally closed valves V43 and V20.

The temperature switch C79 has a normally closed set of contacts that remains closed until a given temperature is reached in cooling the reaction mass. Energizing V43 leads to the unrestrained passage of water through the normally open pneumatic valve V21 to the jacket of E7, while the energizing of V20 opens that valve for the discharge of cooling water from the jacket. C79, which is located in a thermowell contacting the reaction mass in E7, thus acts to bring about corrective cooling until the pressure switch C76 reverses C77. C76, located in the control air line from C201, indicates when it is closed that a desired tolerance of the indicator arm from the control arm of C201 has been achieved. The control arm of C201 at this time is at a pH of 7.0. When the pH of the mass in E7 has properly adhered to the schedule set by C201, the engaging and disengaging of C77 follow one another rapidly. However, when this is not true, the temperature corrective measures set into operation by this section of the interlocks act to prevent the loss of the batch in E7.

The last of the more instructive phases of the interlock system associated with E7 is that portion which deals with the coordination between II-F and II-G, and also the functioning of C202 in carrying out the temperature program in II-C and II-D.

As we noted above, the strictest adherence to the time-temperature schedule for E7 is essential to the preparation of a good resin glue. This demands that, during the programming, C202 must be capable of shuttling its control from control of water flow to control of steam flow to the jacket, and vice-versa. Also, as later noted, C202 has another function.

The shuttling train by which C202 moves from control over water flow to control over steam flow to the jacket of E7 involves that section of the interlock system in which C71, C72, C73, C75, C74, C99, C84 and C82 appear. C202 is specified to be a controller of the type which has a declining control air output as the indicator arm approaches the control arm from the low temperature region.

Let us assume that the cam pushes the control arm to a position of lower temperature from a condition of previous coincidence with the indicator arm of the instrument. C202 is adjusted to give a control air output pressure of 1 psig. when indicator and control arms coincide. Thus, this movement of the control arm results in the decline of output air pressure to 0 psig. The double-pole, double-throw pressure switch C71, located on the upstream side of the three-way valve V46, is adjusted to reverse its position at all pressures less than 1 psig. and so responds by delivering a phase signal from its normally open set of contacts to the solenoid member and load contacts of the "on-delay" timing relay C73, and also to the engaging section of C75's actuating solenoid, thus engaging C75. Thus, during delay interval of C73, phase is applied to the airflush valve V48 via C75, and to the normally closed condensate discharge valve V47 via C75 and C106. Prior to the shifting of C202's control to the control of water flow to the jacket, therefore, E7's jacket is purged of condensate.

At the end of the delay interval of C73, the phase signal is relayed across the normally closed set of contacts of C72 and via one of the load contacts of C99 to the valve set V44, V43 and V20. The energizing of the three-way valve V44 leads to the delivery of control air from C202 to the pneumatic top of V21. Energizing V43 opens water flow to the throttling control exercised by the pressure-to-close pneumatic valve V21, while the energizing of V20 opens the water discharge from the jacket of E7. Thus, the control of C202 over the flow of water to E7's jacket is established.

Let us now assume that the action of the cam member of C202 moves the control arm past the indicator arm, in the direction of rising temperature. This produces a sharply increased control air pressure from C202. C72, located on the downstream side of V44, is adjusted to reverse its position at all air pressures greater than 1 psig. and so applies phase to the solenoid member of C75, to reverse that relay. Because of the disengaging of C75, phase is then applied to the normally closed contacts and the solenoid member of the "on-delay" timing relay C74. For the delay interval of C74, phase therefore is applied to the air flush valve V48 via C75, while the water drain valve V22 is energized directly from the downstream side of the normally closed contacts of C74. Simultaneously, the increase in controlled air pressure throws C71.

When V48 and V22 are energized, the jacket of E7 is flushed of residual water before starting steam flow to the jacket. At the end of the delay period of C74, phase which originates at the normally closed contacts of C71 is applied through the normally open contacts of C74 to the steam condensate discharge valve V47 and the three-way air valve V46. The energizing of V46 leads to application of control air from C202 to the pneumatic top of the normally closed pneumatic valve V19, and so establishes the control of C202 over the flow of steam to the jacket of E7.

To start and continue the dehydration of the resin solution in E7, C202's control is transferred to control over the necessary vacuum conditions for dehydration. Since the temperature during dehydration is most important to the quality of resin solution produced, and since the temperature depends on the vacuum applied

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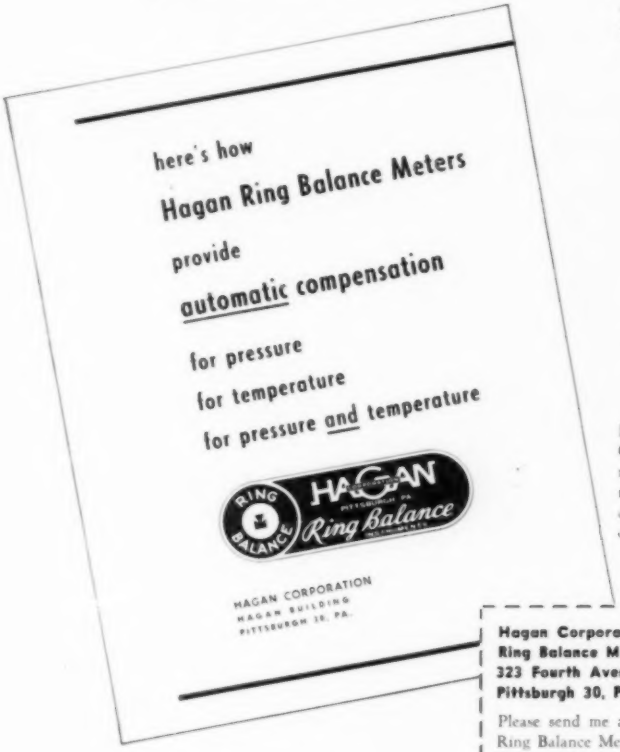

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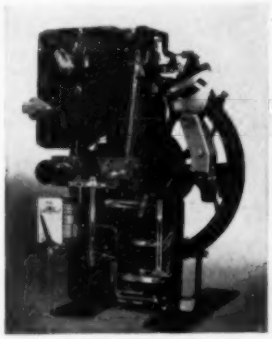

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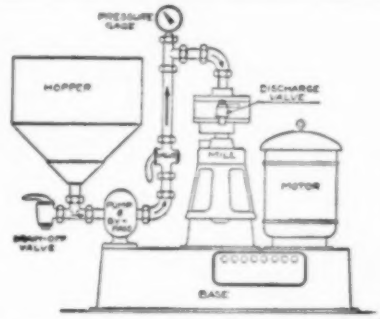

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to E7, the switching of C202's control, from control over the flow of media to the jacket of E7, to control over the vacuum applied to E7, means both instrumentation economy and satisfaction of the demands of the process.

The section of the interlock system which achieves this shifting of the control of C202 involves C98 and C99 principally. C98 is a limit switch closed by the cam of C202 when the time for operation II-F arrives, thus causing the relay C99 to become engaged. The engagement of C99 leads to: (1) energizing of the three-way valve V45 to place full supply air pressure on the pneumatic top of V19, thus opening V19 for the virtually unrestricted flow of steam to the jacket of E7; (2) energizing of the steam condensate valve V47 via C106 so that no feedback from V47 to C75 is possible; (3) energizing of valves V29, V30, and V31 so that the system E7, E9 and E10 becomes "air-tight," and so that condensate coming from E9 is directed to E10; (4) energizing of the three-way valve V50 so that the control air pressure from C202 is applied to the pneumatic top of the air bleeder valve V36; (5) setting of counter C83 into its counting cycle through the energizing of C84; and (6) starting of pump P6 so that the vacuum jet E11 goes into operation.

These results of the engaging of C99 mean the starting and maintaining of the vacuum dehydration operation, until C99 is again disengaged.

The disengaging of C99 follows from the removal of such an amount of water from E7 that the desired concentration of resin solution is obtained. Using the probe "P" of the level switch C88 to detect when a given accumulation of water-of-dehydration has occurred, a signal is emitted from tap "5" of C88 each time that probe "P" is immersed. The transmission of this signal to the solenoid of C87 registers an impulse on the counting coil of C83, and also operates the pump P3 to discharge E10. After a pre-set number of counts is exhausted, corresponding to the desired take-off of water, the mechanism associated with the counting coil of C83 allows the normally closed set of load contacts of C83 to close, thus transmitting a disconnect signal to C99. Accordingly, all operations associated with the engaging of C99, i.e., operations dealing with the vacuum dehydration of material in E7, are brought to a stop, and C202 resumes its control over the balance of the time-temperature scheduling of the mass in E7. —*End*

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	Current Projects		Cumulative 1949	
	Proposed Work	Contracts	Proposed Work	Contracts
New England	.....	.....	$274,000	$1,707,000
Middle Atlantic	$1,000,000	$2,145,000	107,203,000	18,763,000
South	625,000	368,000	11,876,000	34,515,000
Middle West	6,000,000	656,000	26,964,000	34,306,000
West of Mississippi	1,490,000	1,386,000	73,398,000	106,006,000
Far West	250,000	475,000	17,050,000	63,227,000
Canada	1,070,000	75,000	31,575,000	61,498,000
Total	$10,435,000	$5,105,000	$328,340,000	$320,022,000

Proposed Work

Calif., Santa Clara—Monsanto Chemical Co., 911 Western Ave., Seattle, Wash., plans the construction of a manufacturing plant here. Estimated cost $250,000.

Fla., Jacksonville—National Container Corp., Tallyrand Ave., plans to construct several new buildings at its plant, also provide other additional facilities. Estimated cost $550,000.

Ga., Macon—Bibb Paper Co., plans to rebuild its warehouse here. Estimated cost $75,000.

Ill., North Chicago—Abbott Laboratories, 1400 Sheridan Rd., plan to construct a multi-story addition to their plant. Naess & Murphy, 80 East Jackson Blvd., Chicago, Archts. Estimated cost $1,500,000.

Mo., St. Louis County—Laclede-Christy Co., D. M. Watkins, Pres., 411 North 7th St., St. Louis 1, plans to construct a plant for the manufacture of vitrified clay sewer pipe, including building, tunnel kilns, equipment, etc. Estimated cost $500,000.

O., Cleveland—Standard Oil Co., Midland Bldg., plans to enlarge the catalytic cracking facilities at Cleveland Refinery No. 1. Estimated cost $4,500,000.

Okla., Oklahoma City—Eagle-Picher Paint & Varnish Div. of Eagle-Picher Lead Co., 1801 West Grand Ave., plans to construct a new factory. Holifield & Stone, Colcord Bldg., Archt. Estimated cost $90,000.

Pa., Marcus Hook—Congoleum-Nairn Co., Marcus Hook, plans to alter Building No. 12. Estimated cost will exceed $68,000.

Tex., Houston—Houston Oxygen Co., Inc., 5611 Clinton Dr., has purchased a 7½ acre tract at Long Point Rd. and Southern Pacific Ry. tracks, and plans to construct an oxygen plant. Estimated cost $250,000.

Tex., Houston—United Creosoting Co., 1704 Oliver St., has purchased a 66½ acre site adjacent to the Industrial Area and plans to construct a creosoting plant. Estimated cost $500,000.

Tex., Irving—Humble Oil & Refining Co., 3010 McKinney St., Houston, plans to construct an addition to its gas terminal station. LeRoy F. Skubic, 53 West Jackson Blvd., Chicago, Ill., Archt. Estimated cost $150,000.

Alta., Calgary—Supreme Refineries, Ltd., 233 24th Ave., W., plans to construct a laboratory, boiler house and pump house at its refinery. Estimated cost $100,000.

Ont., Etobicoke—Faberge Perfumes (Canada) Ltd., 690 King St., W., Toronto, Ont., plans to construct a perfume processing plant, warehouse and showrooms. Estimated cost $125,000.

Ont., Port Arthur—Koppers Co., Inc., Koppers Bldg., Pittsburgh, Pa., plans to construct a plant here. Estimated cost $200,000.

Ont., Toronto—Consumers Gas Co., 19 Toronto St., plans to construct auxiliary coke and gas plants. Estimated cost $300,000.

Que., Drummondville—Marine Optical Manufacturing Co., 28 Mahler Rd., Boston, Mass., plans to construct a 1 story, plant for the manufacture of plastic optical frames. Estimated cost $100,000.

Que., Montreal—Firestone Tire & Rubber Co. of Canada, 21 Beach Rd., Hamilton, Ont., plans to construct a warehouse here. Estimated cost $75,000.

Que., Montreal—Kruger Paper Co., Ltd., 941 Inspector St., plans to construct a 1 story warehouse. Estimated cost $100,000.

Que., St. Pierre—E. J. Anderson, Villa St. Pierre, plans to construct a factory to process animal and vegetable oils. Estimated cost $70,000.

Contracts Awarded

Calif., Richmond—Standard Oil Co. of California, 841 Standard Ave., will construct a warehouse with own forces. Estimated cost $75,000.

Ind., East Chicago—E. I. du Pont De Nemours & Co., Inc., Wilmington, Del., has awarded the contract for the design and construction of a sulphuric acid and freon plant addition to its chemical plant here to F. H. McGraw & Co., 109 North Wabash Ave., Chicago, Ill. Estimated cost $200,000.

La., Shreveport—United Gas Pipeline Co., c/o contractor, has awarded the contract for the construction of a research laboratory to Werner Co., 1320 Pierre Ave. Estimated cost $300,000.

Mo., Maplewood—Joseph H. White & Sons Development Co., 7810 Weaver St., will construct a 1 story warehouse to be leased to Grove Laboratories. Work will be done by owner with separate contracts.

Mo., St. Louis County—California Spray Chemical Corp., 5 Forsyth Walk, Clayton, has awarded the contract for a 1 story, 80x140 ft. factory, warehouse and office building to S. M. Studt, 7 Forsyth Walk.

Mo., St. Louis—J. D. Streett & Co., 4055 Park Ave., has awarded the contract for the construction of a lubricating oil plant and petroleum storage facilities, including three 1-story building additions, dock facilities, etc., to Murch-Jarvis Co., Inc., 718 Locust St., St. Louis. Estimated cost $1,000,000.

N. C., Goldsboro—Carbide & Carbon Chemical Corp., 30 East 42nd St., New York, N. Y., has awarded the contract for a pyrofax plant here to R. N. Rouse & Co., Inc., 1019 N. William St., Goldsboro.

O., Fairport—Dasher Rubber & Chemical Co., Fairport Harbor, plans to construct an addition to its processing plant on High St. Work will be done with separate contracts. Estimated cost $250,000.

O., Toledo—F. S. Royster Guano Co., 4100 Creekside Rd., has awarded the contract for an addition to its fertilizer plant to A. Bentley & Sons Co., 201 Belmont St. Estimated cost $70,000.

Ore., Cascade Rocks—Columbia Electro-Chemical Phosphate Co., Cascade Rocks, plans to construct a plant. Work will be done by force account. Estimated cost $400,000.

Pa., Harrisburg—Esso Standard Oil Co. of Pennsylvania, 21 South 12th St., Philadelphia, has awarded the contract for a warehouse to Shelley Spera Construction Co., Inc., 227 State St., Harrisburg. Estimated cost $70,000.

Pa., Lansdale—American Encaustic Tiling Co., Lansdale, has awarded the contract for a 1 story, 70x141 ft. storage building to A. Wilson & Co., 136 Liberty St., New York City. Estimated cost $75,000.

Pa., West Point—Sharpe & Dohme, Inc., 640 North Broad St., has awarded the contract for the construction of a synthetics plant and auxiliary facilities to United Engineers & Constructors, Inc., 1401 Arch St., Philadelphia. Estimated cost $2,000,000.

Tex., Texas City—Pan-American Refining Corp., Texas City, has awarded the contract for the construction of a refinery to Tellepsen Construction Co., 1710 Telephone Rd., Houston. Estimated cost $250,000.

Wis., Eau Claire—United States Rubber Co., 1230 Avenue of the Americas, New York, N. Y., has awarded the contract for a 4 story, 175x440 ft. warehouse here to Geo. A. Fuller Construction Co., 111 West Washington St., Chicago, Ill.

Wis., Kaukauna—Thilamany Pulp & Paper Co., Kaukauna, has awarded the contract for a 1 story, 50x200 ft. warehouse addition to Permanent Construction Co., 4100 North 3rd St., Milwaukee.

Ont., Toronto—W. J. Hughes, 212 Wychwood Ave., has awarded the contract for a 3 story 25x60 ft. glass factory to G. Bell, 127 Rainsford Rd. Estimated cost $75,000.

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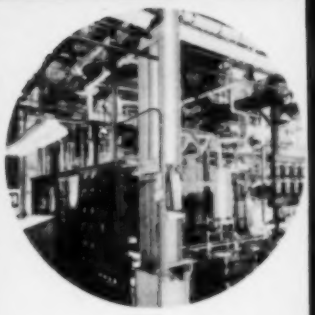

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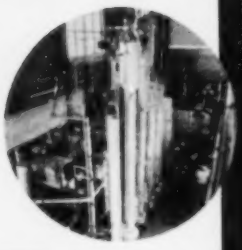

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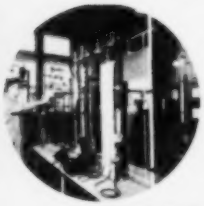

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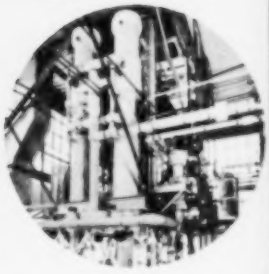

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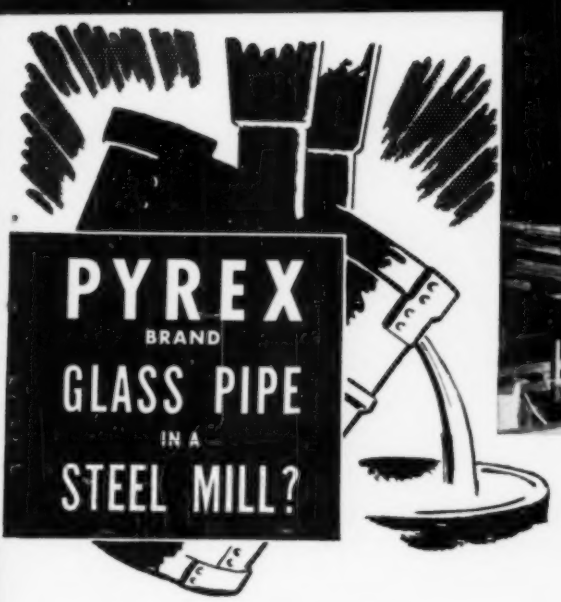

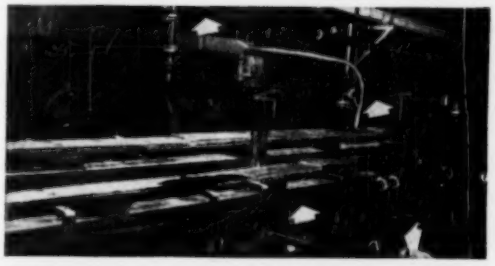

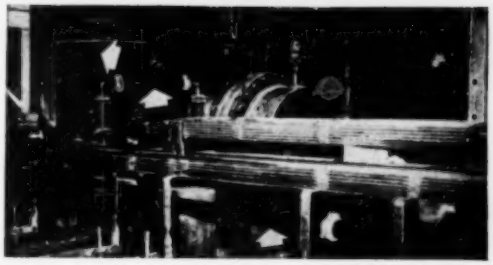

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The Safety Head

TIME: The night of February 5, 1933

PLACE: An oil field near McPherson in Western Kansas

A cold, biting wind swooped down from Colorado onto the plains of Western Kansas. Inside their homes the farmers had bundled up against the winter night. The light from stoves shone faintly through many windows. Inside all was warm and still.

On the Sadey oil well lease near McPherson the cold wave broke suddenly. Cold, brittle air crept up on gas lines, froze them, slowly built up pressure. The gas discharge line on a 500 lb. separator froze tight. Pressure increased. Then . . . everyone for miles around was shocked into waking by a terrific explosion! The separator flung its twisted pieces over a 40-acre lot.

In the morning these pieces were gathered together. Experts examined them. They discovered no weakness in any piece. The breaks did not follow the seams. Plainly, the vessel had been shattered by too much pressure.

On the same night . . . in the same oil field . . . less than a mile away . . . stood a similar 500 lb. separator. Its size and thickness were exactly the same as the separator which had exploded. Exactly like the other separator **except for one detail.** A BS&B Safety Head had been installed on top to protect against over-pressure. The gas discharge froze in exactly the same way. Pressure increased. A pumper, who had just arrived, trembled as he watched the pressure suddenly rise to the bursting point. Then the Safety Head burst. The pumper blew a sigh of relief. The separator had been saved . . . and so had he!

In a few days the dramatic story of how a Safety Head in Kansas saved a separator and a life got back to BS&B. Safety Heads were a young product in those days. It was good to hear that they were making good. After a thorough check, engineers filed the report along with other reports praising Safety Heads. These had been coming in since the product had been put on the market. But, no one at BS&B realized, even then, how far the Safety Head would go.

It had all started in the oil fields. Oil men, working with oil and gas separators, began running up against great volumes of gas from high pressure wells. When the pressure reached the danger point something had to give—the relief valve or the separator. Ordinary relief valves stuck and jammed. No one was ever sure just when they would blow. Lives and property were in danger.

The cry went out for a relief valve that would blow when it was supposed to blow and relieve excess pressure **fast.**

Black, Sivalls & Bryson took the challenge and went to work. Engineers held conferences. They went out and talked it over with men in the field. Then they came back and compared notes. They concluded that the answer might be an entirely different type of relief device. But, what type? That was the question.

One day BS&B's chief engineer was seated at his desk thinking it over. His eyes wandered to a wire running along the ceiling. His thoughts ran something like this—"Electrical circuits suffer from 'over-pressure', too . . . what happens when an electrical circuit gets over-loaded? . . . why, the fuse burns out, of course . . . the fuse is the 'weak spot' which sacrifices itself to save the rest of the circuit. Why not put a weak spot into a pressure vessel which would burst first and save the vessel?" He thought of shear-keys in the flywheels of punch presses and soft plugs in boiler crown sheets. They were weak spots, too. He jumped to his feet and called his fellow engineers together. They agreed that perhaps he was on the right track. Several engineers and workers were put on the job. Experiments began.

They started with thin, flat, metal diaphragms clamped between flanges. These diaphragms were placed on a test vessel and subjected to pressure. It didn't take long to see that flat diaphragms wouldn't get the job done. They bulged at very low pressures. They got "tired" too fast. So they were thrown out and the crew next tried shear heads.

These shear heads were thick, flat disks machined accurately at their outer edges. They were tested only once. The ten pound disk shot high into the air from the test vessel and just missed a bystander on the way down. Too heavy. Too dangerous.

Formed heads were the next type tried. The crew thought that perhaps this was the answer; but, again—failure. It was the same story. When the heads ruptured they became a menace to anyone standing near.

Someone suggested diaphragms of thin, rolled metal formed in the shape of a spheroid. The crew buckled down to the slow process of planning and designing. Various shapes were punched out and tested. Getting the right proportion was, at first, very difficult. But when these spheroid-shaped discs were proportioned correctly, they seemed to do the job. Everyone on the crew who had worked so hard to lick the problem was holding his breath. Was this, at last, the answer? They weren't sure yet . . . many more tests had to be made.

One thing slowly became evident. Bursting pressures were checking out! Engineers were able, after many tests, to determine that a certain thickness and diameter of a certain metal would burst at a certain pressure. They noticed, too, that when the discs burst, they shattered into many small pieces which fluttered harmlessly away. They were definitely not dangerous.

More tests were made. The engineers had to be absolutely sure that every time a diaphragm burst, it left a smooth, full-throated opening. The diaphragms passed the test. It looked as though the gimmick had been found. But, it was not time to celebrate yet. They had to be sure that the diaphragms would pass the test of time . . . that they would not wear out too soon.

To test their stamina, Safety Heads (as they were now being called) were connected through a two-way valve to a reservoir of compressed air. The reservoir was kept at 150 lb. working pressure. The valve was operated continuously.

(ADVERTISEMENT)

Story

It admitted a slug of pressure to the diaphragm, then exhausted it to the air. The cycle was repeated about forty times a minute.

Months of anxious waiting passed. The fatigue tests dragged on. At last the day came for the showdown.

A diaphragm, hooked to the testing device, had undergone twenty years of steady service crammed into a few days. The crew gathered around the testing equipment. Each one knew what was at stake. If the bursting pressure of this diaphragm was not lowered by the grind of the test, they had won.

The diaphragm was taken off the equipment and put on the test vessel. Pressure in the vessel was increased. The arrow crept up and around the dial. No one breathed. The arrow crept slowly on . . . right up to the bursting pressure and then BANG! . . . the diaphragm burst. After hundreds of thousands of pulsations the bursting pressure of the disc had not been lowered by a pound! The battle was over.

Safety Heads had passed some of the stiffest tests ever given to any relief device. Now BS&B was ready to let oil men know that their cry had been answered . . . that the gimmick had been found. And oil men gasped when they heard the guarantee, "A BS&B Safety Head will burst within 5% of its predetermined pressure and temperature." Orders for Safety Heads poured in.

It was not long before other men in other industries saw how Safety Heads could protect their pressure vessels from the constant menace of over-pressure. As the needs of these men grew, the number of types, sizes, and shapes grew. Today, over a half a million Safety Heads have been shipped from the BS&B plant. On pressure vessels all over the world, they stand like sentinels . . . silently protecting the men and machines they serve.

If you have pressure vessels in your plant, perhaps Safety Heads are the answer to your over-pressure problem! Write today for full details to Black, Sivalls & Bryson, Inc., Section SH-5, Special Products Division, 720 Delaware, Kansas City, Missouri.

(ADVERTISEMENT)

Come to POWELL for

There are obvious disadvantages in buying flow control equipment from several different sources. Then why get your bronze or iron valves from one place, your steel valves from another, and possibly corrosion-resisting valves from several others, when Powell *makes them all**?

This is an age of specialization; and whereas various manufacturers are emphasizing valves that meet certain flow control requirements, Powell specializes in making valves to meet *all* the demands of every branch of Industry. And there's only one standard of quality at Powell—to make the right valve to suit the service, and to make it the best.

Plants representing every branch of Industry have found that it pays to make Powell—and *only* Powell—responsible for the performance of all their flow control equipment. So why not come to Powell for all *your* valve requirements?

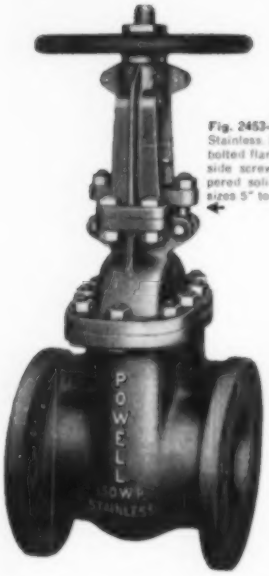

Fig. 2463-G — Large 150-pound Stainless Steel Gate Valve with bolted flanged yoke-bonnet, outside screw rising stem and tapered solid wedge. Available in sizes 5" to 30", inclusive.

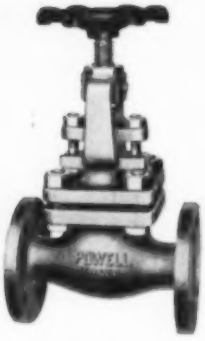

Fig. 1969-NI—150-pound Nickel Gate Valve with flanged ends, bolted flanged yoke-bonnet and outside screw rising stem.

Fig. 1886—Liquid Level Gauge for 350 pounds W. W. P. Offset pattern. Has screwed ends and inside screw rising stem valves. Furnished from rolled bar material (Stainless Steel — Type 304 or 316).

Bellows Sealed "Y" Valve. Powell Bellows Sealed Valves—Globe and "Y" patterns—are designed for high vacuum service or for installations where packing is unsatisfactory or fails frequently. Available in 18-8S, 18-8S Mo., Monel Metal and Hastelloy sizes ¼" to 12", inclusive.

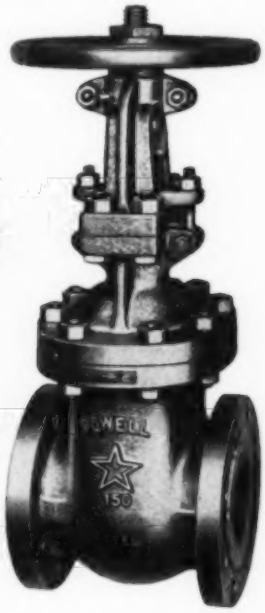

Fig. 1503—Class 150-pound Cast Steel Gate Valve with flanged ends, outside screw rising stem, bolted flanged yoke and tapered solid wedge.

POWELL

ALL your Valves

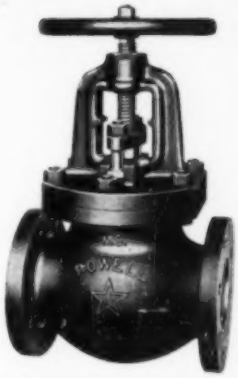

Fig. 241—Large 125-pound Iron Body Bronze Mounted Globe Valve. Sizes 2" to 16", incl. Has outside screw rising stem, bolted flanged yoke and regrindable, renewable bronze seat and disc.

Flush Bottom Tank Valve. Available in two designs. **Fig. 2309**—disc rises into tank to open; **Fig. 2310**—disc lowers into body.

Fig. 1979 S. W.—150-pound Stainless Steel Globe Valve. Flanged ends, bolted flanged yoke-bonnet, outside screw stem. Equipped with Powell Patented Seat Wiper.

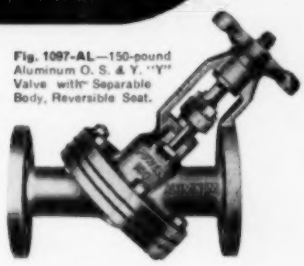

Fig. 1097-AL—150-pound Aluminum O. S. & Y. "Y" Valve with Separable Body, Reversible Seat.

Fig. 2327-AMP — 200-pound Ampco Angle Relief Valve with enclosed spring.

Fig. 375—200-pound Bronze Gate Valve. Screwed ends, union bonnet, inside screw rising stem and renewable "Powellium" wear-resisting nickel-bronze disc.

Fig. 1793—Large 125-pound Iron Body Bronze Mounted Gate Valve. Made in sizes 2" to 30", inclusive. Has outside screw rising stem, bolted flanged yoke and tapered solid wedge. Also available in All Iron for process lines.

Fig. 1843 — 200-pound Monel Metal Swing Check Valve with screwed ends, screwed-in cap.

Fig. 1832-IN — 200-pound Inconel Gate Valve with screwed ends, screwed-in bonnet and inside screw rising stem.

Fig. 560 — 200-pound Bronze Regrinding Horizontal Swing Check Valve. Screwed ends, screwed-on cap and regrindable, renewable bronze disc.

Fig. 1708 — 200-pound Bronze Globe Valve with renewable stainless steel seat and regrindable, renewable "Powellium" nickel-bronze disc.

***The Complete Powell Line includes Globe, Angle, Gate, Check, Relief and Flush Bottom Tank Valves in Bronze, Iron, Steel and a wide range of Corrosion-Resisting metals and alloys.**

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The Wm. Powell Co., Cincinnati 22, Ohio

DISTRIBUTORS AND STOCKS IN ALL PRINCIPAL CITIES

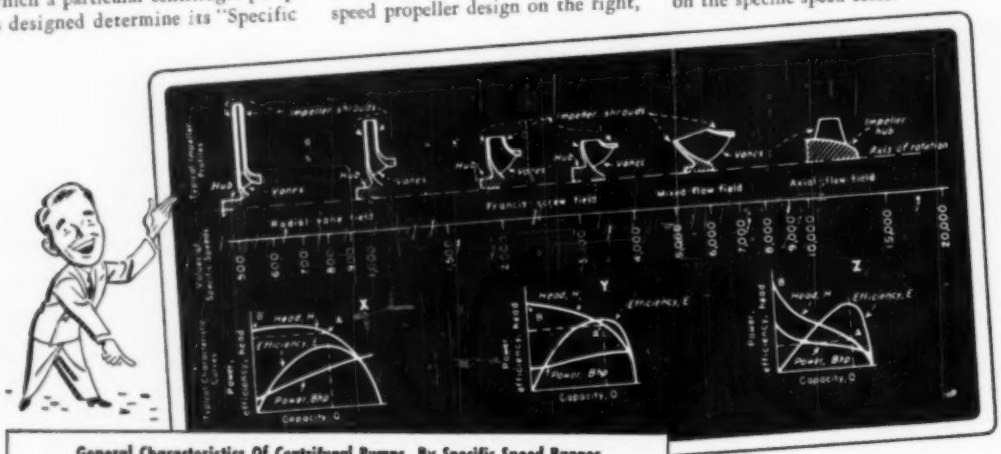
VALVES

Pointers on Pumps

How Do Head, Capacity and Speed Affect Centrifugal Pump Design?

The head, capacity and speed for which a particular centrifugal pump is designed determine its "Specific Speed." Pumps having the same "Specific Speed" will have like proportions and characteristic curves.

The illustration shows several typical pump-impeller profiles, ranging from the low specific speed radial flow on the left to the high specific speed propeller design on the right, each design being placed in its proper position with relation to the specific speed scale. Below the scale, characteristic curves X, Y and Z indicate the hydraulic characteristics of three pumps, each designed for a specific speed corresponding to its position on the specific speed scale.



General Characteristics Of Centrifugal Pumps, By Specific Speed Ranges

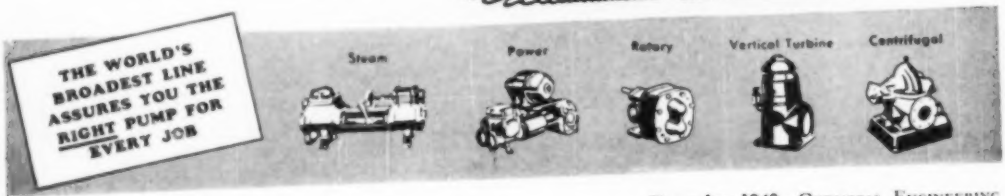
Low Specific Speed — Diagram X	Medium Specific Speed — Diagram Y	High Specific Speed — Diagram Z
Small rise in head from point of maximum efficiency "A" to shut-off "B".	Steeper rise in head from "A" to "B".	Very steep rise in head from "A" to "B".
Wide capacity range at high efficiency.	Moderate capacity range at high efficiency.	Narrow capacity range at high efficiency.
Rapid decrease in bhp from point of efficiency "A" to shut-off "B".	Nearly constant bhp from "A" to "B".	Rapid increase in bhp from "A" to "B".

These basic characteristics may be modified to obtain certain desirable features. For example, although boiler feed pumps have low specific speed, they require a steadily rising head-capacity curve — not one that droops toward shut-off, as shown. There can be any number of pump designs in-between and beyond the few typical ones illustrated here.

You'll Find the Right Pump in the Worthington line — the world's most complete. Another reason why *there's more worth in Worthington* is the expert technical advice, backed by over 100 years of experience, that is always available to you. Just contact your nearest District Office, or write to *Worthington Pump and Machinery Corporation, Centrifugal Pump Division, Harrison, New Jersey.*

WORTHINGTON

co-2



A DRY CHEMICAL EXTINGUISHER WITH TRIGGER-FINGER CONTROL

Here's dry chemical at its fire-fighting best—in *Kidde-designed* extinguishers.

Kidde Dry Chemical Extinguishers use the same simple, familiar principle of Trigger-Finger Control made famous by its performance on *Kidde* Carbon Dioxide (CO_2) Portables.

Pressure of a single finger on the trigger of a *Kidde* Dry Chemical Extinguisher opens the valves—and makes it work. Release the trigger—both valves close.

Small port at bottom of CO_2 outlet tube allows gas to fluff up the dry chemical. *No packing of chemical in chamber.* Powder discharges at top of chamber, through siphon. *No packing at hose connection.* Trigger-Finger Control eliminates shut-off valve at horn. *No packing in hose.* Baffle in horn gives better dispersion pattern. Made in 20 and 30 lb. models.

These are the dry chemical extinguishers you want for most effective action against outdoor fires in flammable liquids and electrical equipment. Mail coupon for literature.

Kidde

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Walter Kidde & Company, Inc.
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Gentlemen: Please send me literature on your dry chemical extinguishers.

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Company.....

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OUR SECTION of the Engelhard Industries exhibit at the Twenty-Second Exposition of Chemical Industries, Grand Central Palace, New York, will offer you a rare opportunity to see the multitude of applications of the platinum metals in industry. Among the important items we will have to show you will be Platinum Gauze for Ammonia Oxidation, Platinum Laboratory Ware, Platinum Electrodes, Platinum Clad, Spinnerettes for Synthetic Fibres, Thermocouple Wires, Platinum and Palladium Catalysts on various carriers, Precious Metal Salts and Solutions, Platinum for the Glass Industry, Silver Gauze and many other items.

See the Nitroneal Generator

This new Generator can reduce your nitrogen gas cost as much as 90%. By means of Engelhard catalysts, it produces a pure nitrogen gas with a controllable hydrogen content (.1% to 40%) without any explosive hazard.

With the direct ammonia-air reaction, there is a gain of two volumes of nitrogen for each volume of hydrogen removed. Capacities are from 100 cfh to 10,000 cfh.

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BOOTHS NOS. 451-452
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PHENOLIC CURING

PROCESS EMPLOYED BY

GLASS FIBERS, INC.

demonstrates controllability of GAS

VITRON* Glass Fiber Underground Pipe Wrap, a resin-bound mat, is made in a series of processes utilizing GAS as a fuel, and applied as corrosion-resistant wrapping on underground pipes. The photo was taken at 1/250 of a second, under actual field wrapping conditions, and shows how quickly the wrap is permeated and saturated by the hot coating.

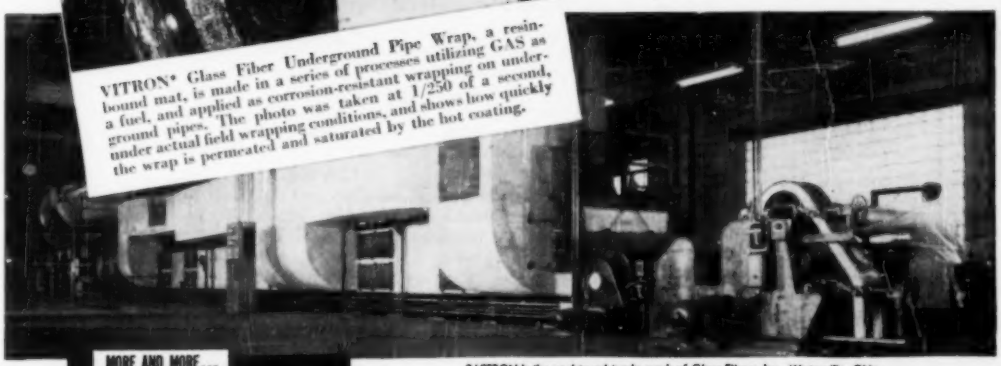
QUALITY CONTROL is directly related to time-temperature control in the production of VITRON* Glass Fibers. To obtain precise control of drying and curing cycles in the manufacture of this phenolic impregnated underground pipe wrap, executives of Glass Fibers, Inc. chose an automatic continuous GAS oven.

President R. H. Barnard expressed their choice of this all-purpose fuel as follows, **"We maintain extremely high-quality production standards for our VITRON Glass Fiber Underground Pipe Wrap. GAS, being easily controlled and highly versatile, is essential to our meeting those standards."** Of course, this Waterville, Ohio, manufacturer uses GAS in making the glass for the basic insulating mat so their engineers were well-acquainted with the efficiency and flexibility of this superior processing fuel.

With this experience in the application of GAS for production operations it was only natural that this versatile fuel should be chosen by Glass Fibers, Inc. for heat-processing the phenolic resin binder on the glass mat.

This highly-specialized application of GAS for production-heating serves to emphasize the versatility of GAS and its efficient utilization on a process requiring precise temperature control. As a fuel for high-speed heat processing under exacting conditions GAS meets every requirement. Your Gas Company Representative can show you many examples.

Continuous Gas-fired oven for curing phenolic resin on glass fiber mat.



MORE AND MORE...

THE TREND IS TO GAS

* VITRON is the registered trade mark of Glass Fibers, Inc., Waterville, Ohio

AMERICAN GAS ASSOCIATION

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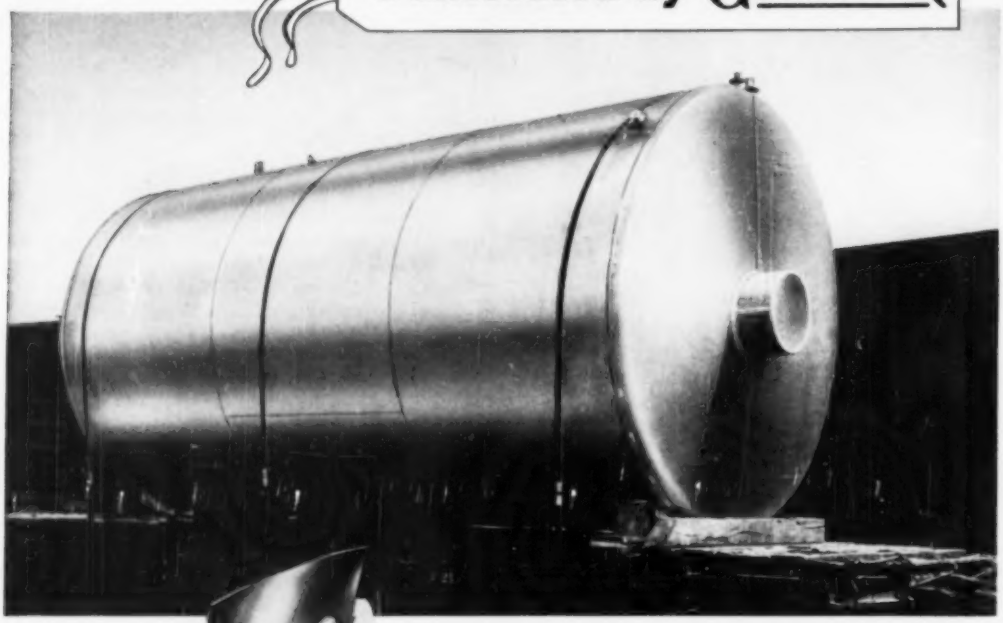
Fabricated by GRAVER



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in STAINLESS and alloy steels

• Here's another product of "The Hands of Skill." In this case, it's a large aluminum tank fabricated by Graver for a prominent soap manufacturer.

No matter what materials your process requires—stainless steel, stainless clad, nickel, nickel clad, Monel, Everdur, or aluminum—remember that Graver has complete facilities for fabricating vessels of almost any size . . . in gauges of No. 12 and heavier and in finishes up to and including No. 4. Shop built vessels are shipped complete from the plant, as shown, and field crews are available for on-the-site erection of other types of equipment.

Combined with these shop and field facilities is Graver's engineering service, competent and qualified to solve problems of design and material selection. Ask for recommendations and quotations . . . today.

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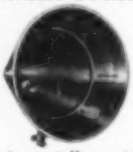
IN STAINLESS OR ALLOYS



Graver is specially equipped to line vessels and towers—in the shop or in the field—using stainless steel or alloys.

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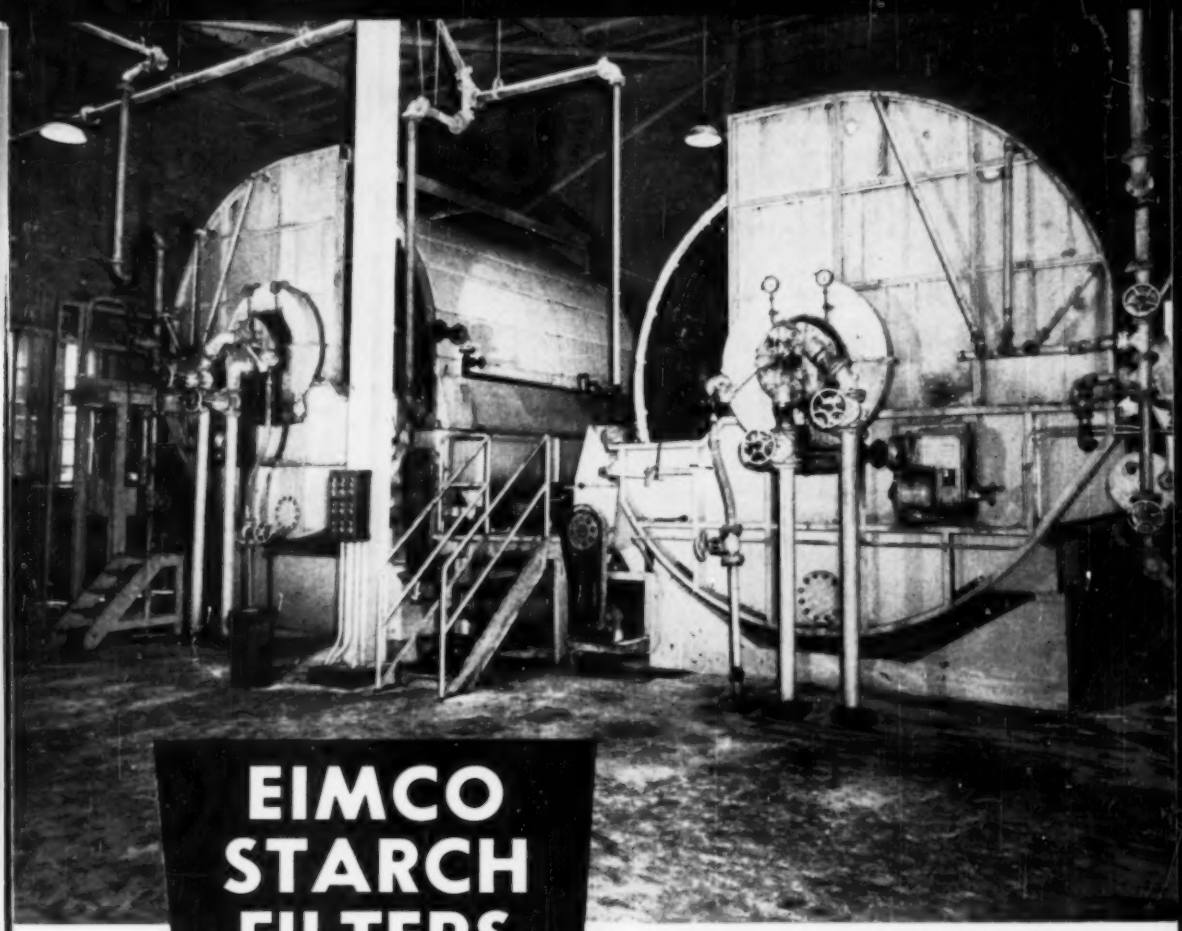

EIMCO STARCH FILTERS

The installation above is a typical Eimco Continuous Vacuum Filter installation for the highly specialized starch industry.

Eimco equipment for starch is custom designed to give the industry higher tonnages per square foot of filter area.

For starch plants the Eimco Vacuum Washing and Dewatering machine assures faster, more thorough washing and greater plant capacities.

Eimco Continuous Vacuum Filters for starch are heavy-duty machines with a special panel design to assure rapid and thorough drainage of each panel. The inherent advantages of Eimco design make these dewatering units preferred equipment in starch plants everywhere.

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Eimco Custom-Made Filters Serve Many Process Industries

Eimco filters are built specifically for each field in which they operate. Filter installations in Chemical and Metallurgical plants, Cane and Beet Sugar plants, Pharmaceutical and Food, Salt, Sand, Steel and Sewage plants. Coal washers, also corn and potato starch plants.

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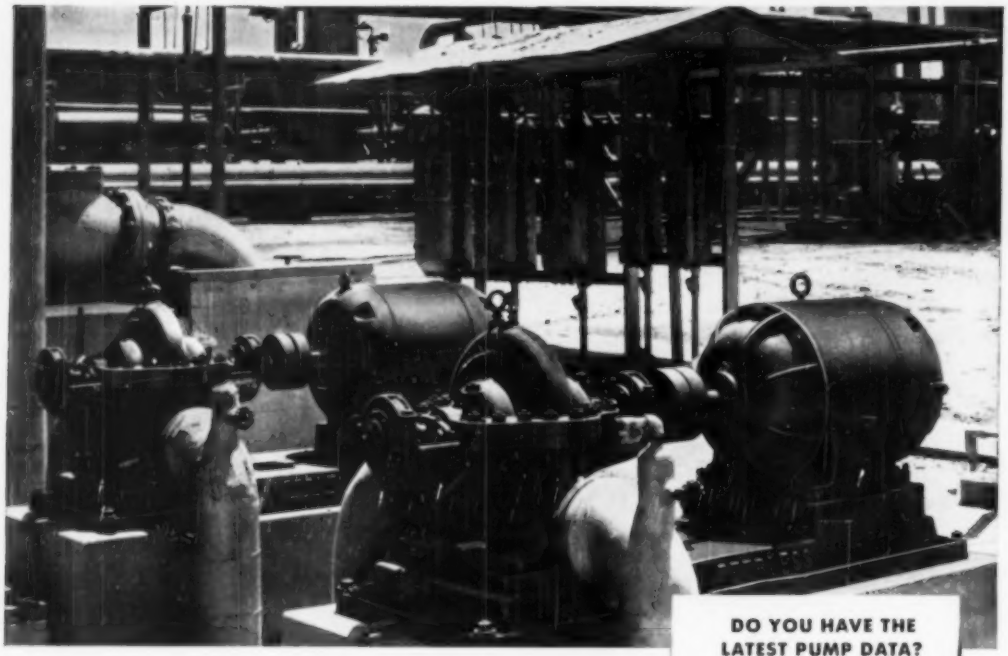
WHERE THERE'S A PUMP IN YOUR PLANS



Plan with Peerless Centrifugal Pumps

From plan to plant there's a Peerless horizontal centrifugal pump that meets your needs. For the diversified, continuous duty services of private industries and public projects, Peerless Pumps incorporate many proved advantages in design and construction for extended pump life and operative economy.

All along your flow lines, Peerless can provide pumps incorporating the latest principles of hydraulic practice and experience plus the versatility and efficiency you require for *peerless* pumping performance.

For example, the pumps shown above are single stage, double suction, general purpose Type A pumps, a comprehensive line of Peerless pumps offering a capacity range from 50 to 60,000 gpm. There are scores of other Peerless types, hundreds of other Peerless models for thousands of pumping applications. Peerless furnishes horizontals for handling solids in suspension as well as for clear liquids. There are pumps for boosting, circulating, transferring and filtering. They can handle volatile L-P Gases or tricky acid, basic and salt solutions. They can move liquids at high temperatures or they can provide water (or foam) for *Underwriters' approved* fire protection. Duty can be intermittent or continuous; both single and multi-stage units, with the type of drive you desire, are available, meeting widest head and capacity conditions. Pump and driver are engineered as a unit, tested in a modern hydraulic laboratory that duplicates actual field conditions, to match or exceed purchasers' expectations.

Plan with Peerless for all your needs for pumps. Peerless field and sales engineers are located in all principal cities to help you whenever and wherever there's a pump in your plans. For pump engineering information or service, call on them, or if you prefer, write for the latest pump engineering data. The chart at the right lists a number of the types of Peerless horizontal pump bulletins in which you will be interested.

DO YOU HAVE THE LATEST PUMP DATA?

Informative Engineering Bulletins Available From Peerless Pumps

Here are a few of the services Peerless Pumps perform. Request data by Bulletin number.

Pump Service	Bulletin No.
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Fire Protection	B-1500
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Butane-Propane	B-2200
Boiler Feed	B-301
Sewage and Solids	B-154
Hi-Pressure	B-310
Acids and Caustics	D-2400
Process Services	B-803
All-purpose Pumps	B-2301

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Pumps

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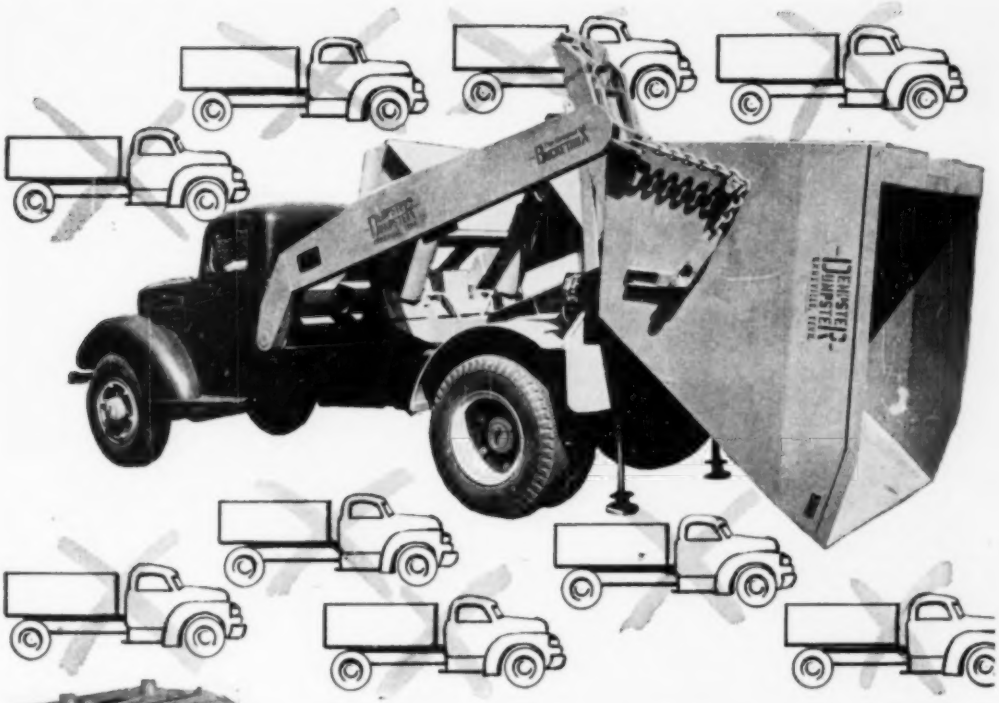

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A simple reply to one of our advertisements . . . a meeting of probing minds over the problems involved . . . the replacing of ten conventional trucks with only one Dempster-Dumpster truck unit and 99 containers . . . fifty thousand dollars annual savings for this one firm.

That, briefly, was the result of a simple inquiry for information about the Dempster-Dumpster System of materials handling.

A comprehensive Dempster-Dumpster survey revealed costly delays, unnecessary handling of materials, and much time wasted by loading crews. All were eliminated to the tune of $50,000 savings annually. Fast pick-up, hauling and dumping of pre-loaded Dempster-Dumpster containers replaced the old method of plant hauling. Ninety-nine detachable containers, built in over 20 sizes and designs for the specific materials they handle, were spotted at material accumulation points. Some are handled by fork trucks, others by overhead cranes within plant buildings. As containers are filled, the Dempster-Dumpster truck hoisting unit and one man, the driver, picks up each container, hauls it to its destination, dumps it and returns the empty container for refilling.

Pick-up and dumping of these detachable containers takes less than 60 seconds. The entire operation works to an on-the-run schedule. One truck hoisting unit handling 99 containers and doing the work formerly requiring ten conventional trucks. Let us bring you the complete details of the Dempster-Dumpster System.

Containers, in standard and special types, in capacities from 1½ to 10 cu. yds. are available. Whatever your materials are, be they heavy, light, bulky, dust, liquid, waste, raw or finished, you'll find a Dempster-Dumpster container ready, or custom built, to do the job more efficiently.

DEMPSTER DUMPSTER
TRADE MARK REG.
SYSTEM

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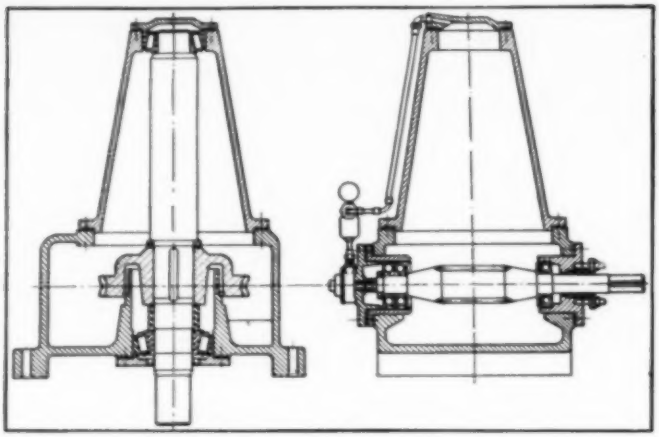
For drives requiring long, unsupported VERTICAL SHAFTS

. . . the new Philadelphia "Steeple" Type Worm Gear Speed Reducer fills a long-felt need.

The "Steeple" type Vertical Worm Gear Reducer was especially developed, and has had much successful use in the numerous Process Industries for driving: Agitators, Mixers, Circulators, Pumps, Washers,—or any other vertical type drive which calls for sturdy, reliable speed reduction.

The wide bearing span insures rigidity for the extended shaft—and the "dry-well" construction eliminates the necessity of a stuffing box on the vertical shaft. And, to insure positive lubrication of the upper bearing on the vertical shaft, an automatic reversing oil pump, together with a filter, is used.

Write for full details on your business letterhead.



The views above illustrate cross sections through the worm and worm gear shafts.

Philadelphia Gear Works, INC.

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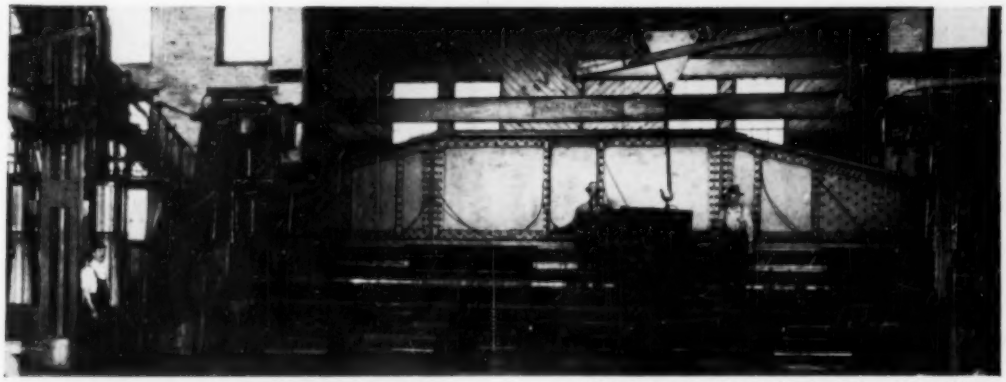
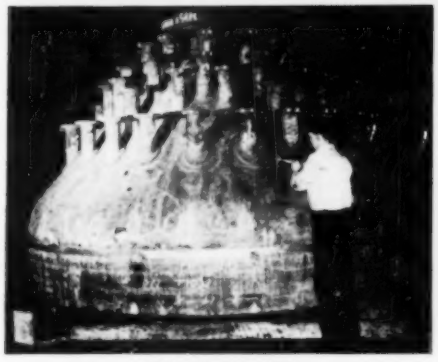
Industrial Gears and Speed Reducers
LimiTorque Valve Controls



1895 photograph of 34-foot Bending Roll at Newport News.



96-foot Reactor Head

51-foot Liquid Chlorine Tank

STEEL FABRICATION PIONEERS . . .

The experience gained at Newport News during the fabrication of millions of tons of steel together with modern facilities has resulted in faster and more diverse production in recent years. Supplementing this fabricating machinery are stress relieving furnaces, radiographing and magniflux inspection equipment. Welders are qualified as either manual or automatic machine operators under both A.S.M.E. and U. S. Navy codes.

Weldments of carbon steel, low alloy steel, stainless and heat resisting steels, and other clad steels are produced in almost any size or shape. Recent output has included refractory towers, wind tunnels, valves and pressure vessels.

The Newport News plant, over a mile in length, includes complete machine shop, casting, forging and other facilities which offer all the advantages of the execution of the complete job.

Builders of Equipment for Chemical, Petroleum and Petro-Chemical Industries

NEWPORT NEWS

SHIPBUILDING AND DRY DOCK CO.

NEWPORT NEWS, VIRGINIA

Do you measure salt by RULE OF THUMB?

For Accurate Salt Measurement *"PASS the SALT"* by LIXATOR*

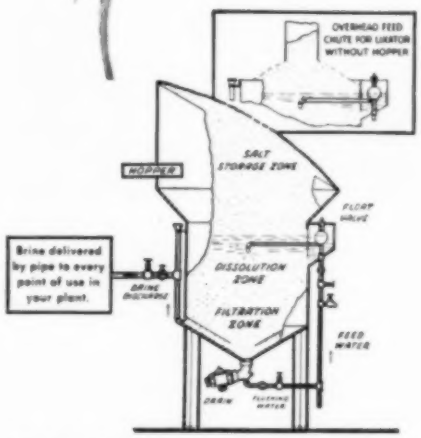
RULE of thumb measurement of salt by volume, in bucket or shovel, or by weight is inaccurate and wasteful.

For example, in measurement by dry salt volume, one cubic foot of dry salt will weigh *anywhere* from 66 to 84.5 pounds. And measurement by dry salt weight is "guesswork," too, for salt may contain from .05% to 5.0% moisture depending upon humidity, length of time in storage, varying bulk and area of the stock pile.

BUT... with the Lixate Process salt measurement is *exact*. Each gallon of Lixate Brine *always* contains *exactly* 2.65 pounds of Sterling Rock Salt. For the Lixator *automatically* makes 100% saturated, crystal-clear, self-filtered brine, that meets the most exacting chemical and bacterial standards. And this brine can be *easily* and *accurately* diluted volumetrically to any desired strength.

In the production of chemicals, leather, textiles, plastics, soap, sulphonated oils, petroleum, food products...in the operation of refrigeration systems and in regenerating zeolite water softeners...accurately measured Lixate Brine cuts salt requirements 10% to 20%. And it also eliminates costly handling, mixing and stirring of salt.

Consult our Technical Service Department on your use of salt and brine. The experienced men on this staff will advise you on the proper location for Lixator and salt storage, pumping arrangements, types of pumps, meters, and valves. They will fit the *money-saving* Lixator into your plant operations. Write today!



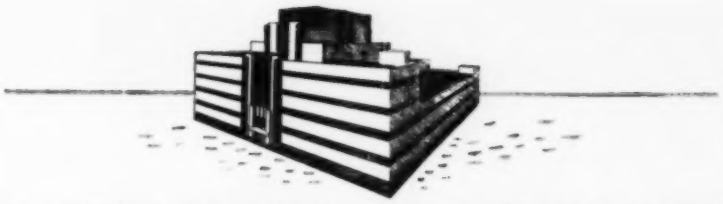
HOW THE LIXATOR WORKS—*In the dissolution zone*—Flowing through a bed of Sterling Rock Salt which is continuously replenished by gravity feed, water dissolves salt to form 100% saturated brine. *In the filtration zone*—Through use of the self-filtration principle *originated by International*, the saturated brine is thoroughly filtered through a bed of undissolved rock salt. The rock salt itself filters the brine. Nothing else is needed.

The LIXATE Process
REG. U. S. PAT. OFF.
for making brine

INTERNATIONAL SALT COMPANY, INC.
Scranton, Pa.

NOW AVAILABLE
The New Stainless Steel STERLING* MODEL LIXATOR*
For "Lifetime" Use
For Greater Economy
For Added Cleanliness

*Trade Mark

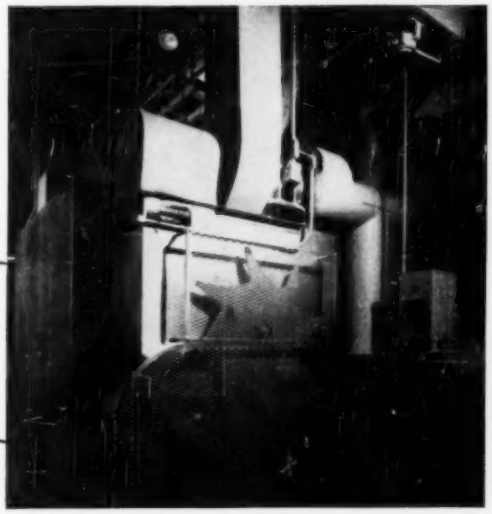


WHEN CENTURY-OLD SMITH, KLINE & FRENCH LABORATORIES

WENT *Ultramodern*, THEY ASKED FOR

"WINTER WEATHER"

THE YEAR AROUND...!



This CHR Lectrodryer delivers DRY air to the area in which deliquescent drugs are packed.

Humidities and temperatures approach a hundred here in Philadelphia. But drugs being packed in rooms served by this Lectrodryer are completely unaware of the fact! There's no moisture in the air to cause deterioration of products or clogging of machine and chutes.

Winter weather the year around; that's what you get when you DRY the air with Lectrodryers. Product quality is safeguarded. Production is held at high speeds, regardless of outside weather conditions.

Lectrodryers also DRY gases and many organic liquids—at atmospheric or high pressures, in minute or tremendous volumes, on a laboratory or production basis. Thousands of Lectrodryers are doing that kind of DRYing in every industry, in plants all over the world.

Bulletin 216 pictures and describes many of these installations. For a copy, and for help on your moisture problems, write Pittsburgh Lectrodryer Corporation, 303 32nd Street, Pittsburgh 30, Pennsylvania.

In England: Birlec, Limited, Tyburn Road, Erdington, Birmingham.
In Australia: Birlec, Limited, 51 Parramatta Road, Glebe, Sidney.

LECTRODRYERS DRY WITH ACTIVATED ALUMINAS

LECTRODRYER

REGISTERED TRADEMARK U.S. PAT. OFF.

FOR METERING

Flow - Level - Pressure

WHERE

ACCURACY

FLEXIBILITY

RUGGEDNESS

ARE IMPORTANT CONSIDERATIONS

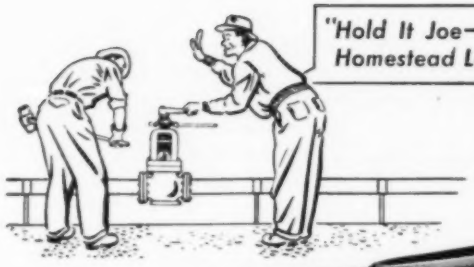
One of a group of Republic transmitters metering flow and level in a modern chemical processing plant.

Republic Pneumatic Transmitters are available for measuring flow, liquid level, pressure or liquid density of a wide range of fluids. They employ the force-balance principle to convert these process variables into air pressures which vary proportionally. These air pressures become direct measurements and can be conducted to reading instruments or used as the measuring impulse for the actuation of an automatic controller.

Republic transmitters have a guaranteed accuracy of within 1/2 of 1% of the transmitter range. By making a few minor adjustments or substituting a few small parts, their operation can be easily changed to any desired range between a minimum of 0-0.6" to a maximum of 0-704" of water. Their construction is more like that of a precision machine than of the sensitive instrument they are. Data Book No. 1001 contains complete details — write for your copy.

REPUBLIC FLOW METERS CO.

2240 Diversey Parkway, Chicago 47, Illinois



Homestead
LEVER-SEALD
Valves

ALWAYS WORK
LAST LONGER
COST LESS PER YEAR

STICKING valves are never a problem with Homestead Lever-Sealds on the job. Built into each valve is a powerful leverage, ready at all times to overcome the effects of corrosion, viscous fluids or temperature and pressure extremes which cause ordinary valves to stick or "freeze."

This powerful leverage not only relieves pressure between the seating surfaces to permit operation under all conditions; but it also is the means of providing the extra tight seal against leakage—the seal which keeps corrosive or erosive line fluids away from the seating surfaces; assures longer valve life and lowest cost per year.

Made in stainless steel, steel, semi-steel, bronze, monel or other alloys suitable for the working conditions under which they are to be used, Homestead Lever-Seald Valves may be had in sizes from 1" to 12"; and for working pressures from 150 pounds to 1500 pounds.

Choose the sizes and types for your services from Reference Book 39 Section 3. Write for your free copy today.

Check these Outstanding Features:

A QUARTER-TURN fully opens or closes valve.

INSTANT STICK-PROOF OPERATION. Plug turns freely after seating pressure is relieved by screw lever.

POSITIVE LEAKLESS SEAL is obtained by applying full seating pressure with screw lever after opening or closing.

LEAK PROOF. Deep stuffing box, gland and sealed bottom prevent fluid loss, and reduce hazards.

STRAIGHT-LINE FLUID FLOW. Little or no pressure drop.

SEATING SURFACES ALWAYS PROTECTED in both open and closed positions. Fluid or grit cannot damage valve seat.

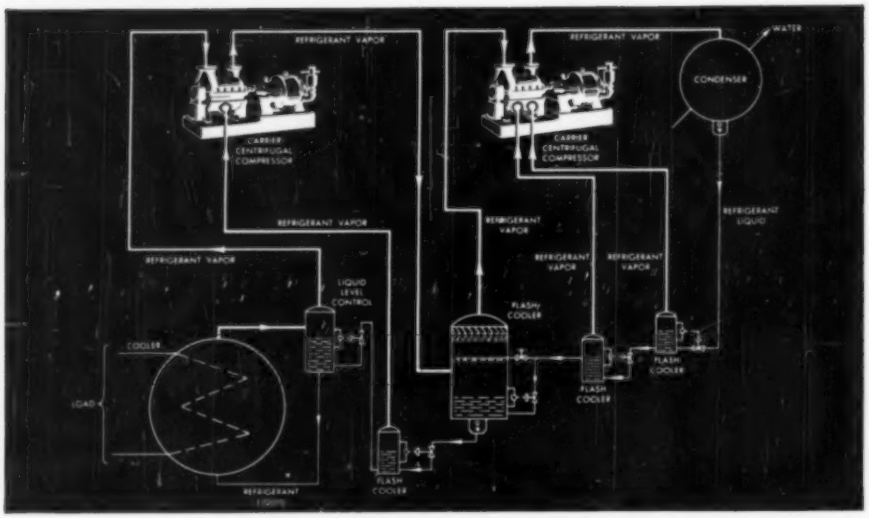
HOMESTEAD VALVE MANUFACTURING CO.

P. O. BOX 13 CORAOPOLIS, PENNA.

PROBLEM:

How to attain ultra-low temperatures economically

SOLUTION:



THIS DIAGRAM shows the use of Carrier Centrifugal Compressors staged in a low-temperature refrigerating cycle employing hydrocarbons or halogenated hydrocarbons as refrigerants. This application of Carrier Centrifugals has been proved exceptionally economical and efficient in many leading plants.

The design of these compact, dependable units provides many advantages, among them:

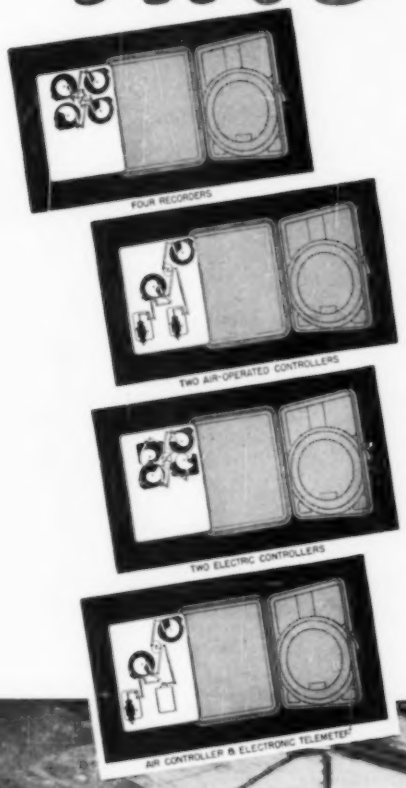
1. No expansion valves or reciprocating mechanism to create problems at ultra-low temperatures.
2. Because the bearings are located outside the gas passages, difficulties with lubrication are at a minimum. This same design feature also improves efficiency by virtually eliminating oil fouling of heat-exchanger surfaces.
3. Carrier Centrifugals require no expensive foundations and can be operated without housing.
4. Rotative design assures low operating and maintenance cost.
5. The installed cost is low and the units can be easily and quickly placed in service.

Besides straight series staging, Carrier Centrifugal Compressors are used in cycles involving a cascade arrangement where full advantage is made of the thermodynamic properties of two refrigerants. This results in reduced exchanger surface and higher efficiencies.

Designed and built in the same tradition of leadership that developed rotative refrigeration more than a quarter of a century ago, Carrier Centrifugal Compressors give long life with low-cost, efficient service. As a result of their proved performance, more of these Carrier-designed machines have been sold than any other kind. They are now available for prompt delivery. For full facts, call your nearest Carrier representative. Carrier Corporation, Syracuse, New York.

Carrier **CENTRIFUGAL COMPRESSORS • REFRIGERATING EQUIPMENT**

these and 100,000 more



FROM 4 CIRCUITS AND 8 BASIC PARTS

What's your control problem? Flow—temperature—level? Are you using solids—liquids—gases?

No matter what you process, four basic circuits and eight basic component parts will give you more than 100,000 different electronic measuring and controlling combinations. That's how Bailey has simplified controls for processing industries.

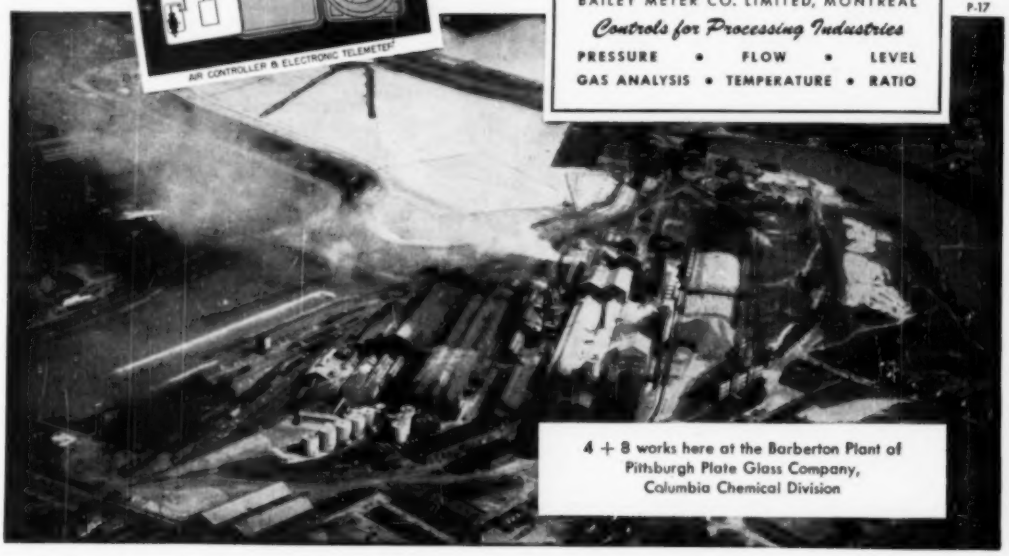
The four arrangements illustrated show how easily Bailey interchangeable parts can be used. It's no longer necessary to carry a huge stock of replacement parts for emergency control installations. When you standardize on Bailey controls you are always ready to meet changing conditions within your plant.

And with Bailey simplified controls, your maintenance costs will be less. Maintenance men quickly become familiar with Bailey controls and spend less time on maintenance and installation.

To see for yourself how you can profit with Bailey controls, write for a copy of our bulletin No. 17.

BAILEY METER CO.
1054 Ivanhoe Road • Cleveland, Ohio
BAILEY METER CO. LIMITED, MONTREAL
Controls for Processing Industries
PRESSURE • FLOW • LEVEL
GAS ANALYSIS • TEMPERATURE • RATIO

P-17



4 + 8 works here at the Barberton Plant of Pittsburgh Plate Glass Company, Columbia Chemical Division

. . . and they specify LABOUR

Although it is a non-priming pump, this LaBour Type Q is operating successfully with a nine foot suction lift. The Q was chosen for its known vapor capacity, since the liquid handled —waste from a plating plant—is gaseous. It is also highly corrosive, as it contains chromic, hydrochloric, and sulphuric acids plus cyanide, with varying amounts of free CO_2 gas.

This pump has been in service 24 hours per day for about two years. It was recently taken down for inspection, and no sign of corrosion was found either on the pump casing or the impeller.

Here is another example of the true economy you get with LaBour pumps. Chemical plant operators have had 27 years of such examples. Old-timers—and many an observant new-comer, too—know when the job is tough they need LaBour . . . and they specify LaBour.

LaBOUR CENTRIFUGAL PUMPS

THE LABOUR COMPANY, Inc. • ELKHART, INDIANA, U. S. A.

Quick Change

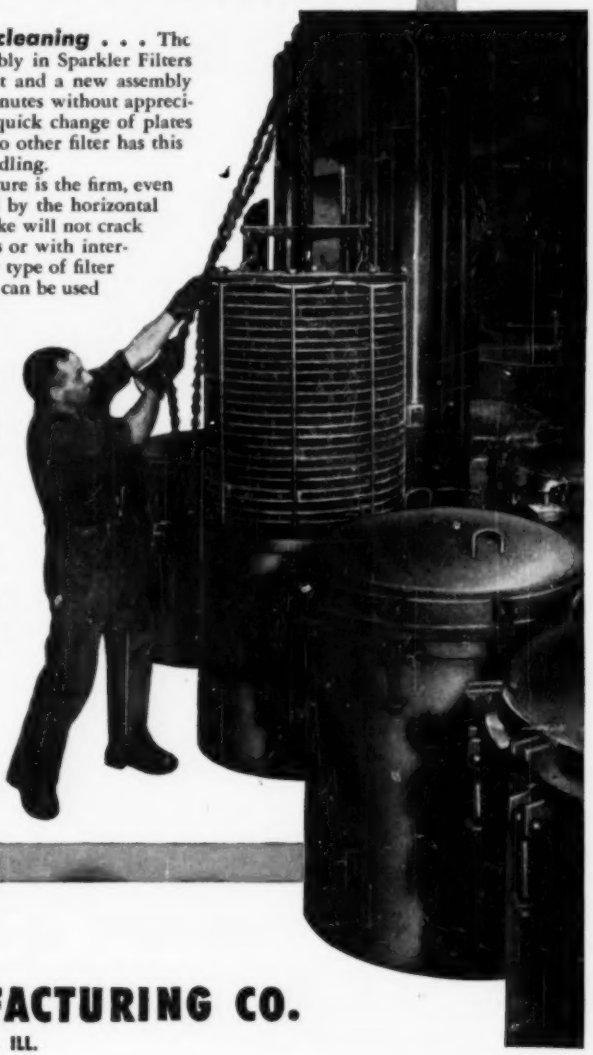
...of filter plates in SPARKLER FILTERS

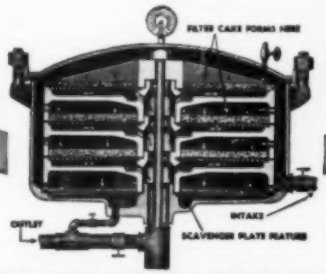
means no shut-down for cleaning . . . The entire horizontal filter plate assembly in Sparkler Filters can be removed as a complete unit and a new assembly lowered into the filter in a few minutes without appreciable interruption in service. This quick change of plates is an exclusive Sparkler feature. No other filter has this unit assembly of plates for fast handling.

Another distinctive Sparkler feature is the firm, even support of the filter cake provided by the horizontal position of the plates. The filter cake will not crack or slip under variation in pressures or with intermittent operation of the filter. Any type of filter paper, cloth, screen, or filter media can be used without danger of breaking. There is no supporting strain on these materials.

Sparkler filters take up little floor space, are completely enclosed, and are available in stainless steel, mild steel, rubber lined, steam or brine jacketed, monel, nickel, or bronze. They are capable of efficiently handling practically any kind of liquid from thin alcohols to varnishes and resins.

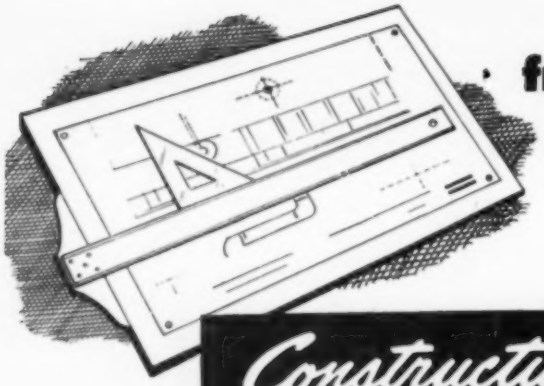
Sparkler service includes laboratory test runs and engineering of continuous flow filtration for production line installations. Write, giving details of your filtering problem.





SPARKLER MANUFACTURING CO.

MUNDELEIN, ILL.



from drawing board to finished job . . .

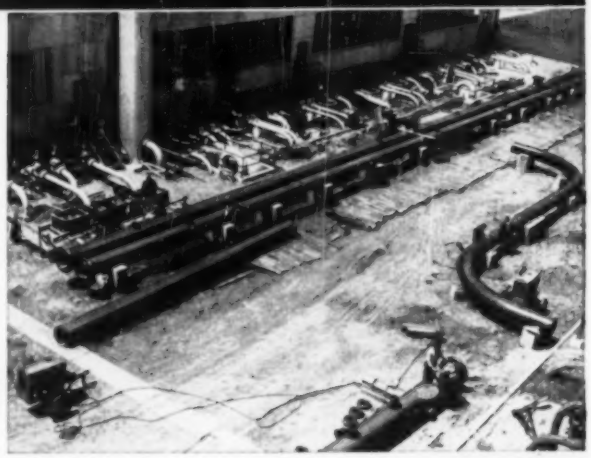
Construction by GRAVER

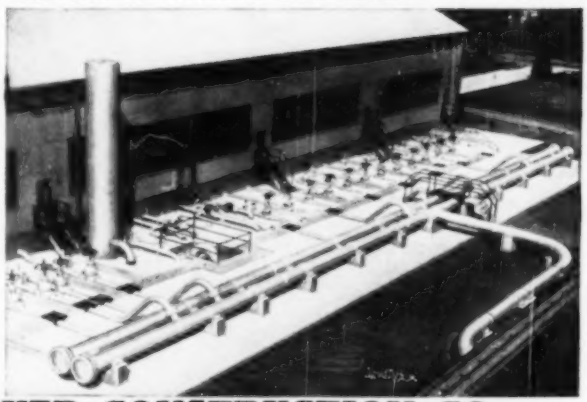
■ Graver Construction Service goes all the way to meet the requirements of the petroleum and process industries — from engineering and planning . . . through material procurement . . . to finished erection.

This complete service covers every step of practically any type or size of project — refinery units or complete refineries . . . piping . . . process equipment dismantled and re-erected . . . pipe line terminals . . . pipe line pumping stations . . . chemical plants . . . recovery plants . . . auxiliary equipment for synthetic rubber plants . . . auxiliaries to all types of refinery equipment.

Experienced personnel and full equipment are maintained at strategic locations for jobs involving foundations . . . structural steel . . . erection of heavy vessels . . . piping . . . brick work . . . painting . . . machinery setting . . . instrument boards . . . and electrical work.

No matter what your requirements may be — maintainance and repair . . . expansion or modernization of existing equipment . . . installation of new facilities — get in touch with the nearest Graver office *at once.*





GRAVER CONSTRUCTION CO.

424 Madison Avenue, New York 17, New York

GRAVER — CHICAGO — ENGINEERING DEPT. 880 BERGEN AVENUE, JERSEY CITY, NEW JERSEY — HOUSTON

A DIVISION OF GRAVER TANK & MFG. CO., INC. EAST CHICAGO, IND.

put this expert on your payroll

...at no extra cost!

Chase Heavy Duty Cotton Bags
Chase Topmill Burlap Bags
Chase Lilipack Paper Bags
Chase Saxolin Open Mesh Bags
Chase Specialties: Mailing Bags, Spiral Tubing, Twines

Your Chase Salesman is a thoroughly trained bag specialist. He knows materials, design, construction, and the most modern packaging techniques.

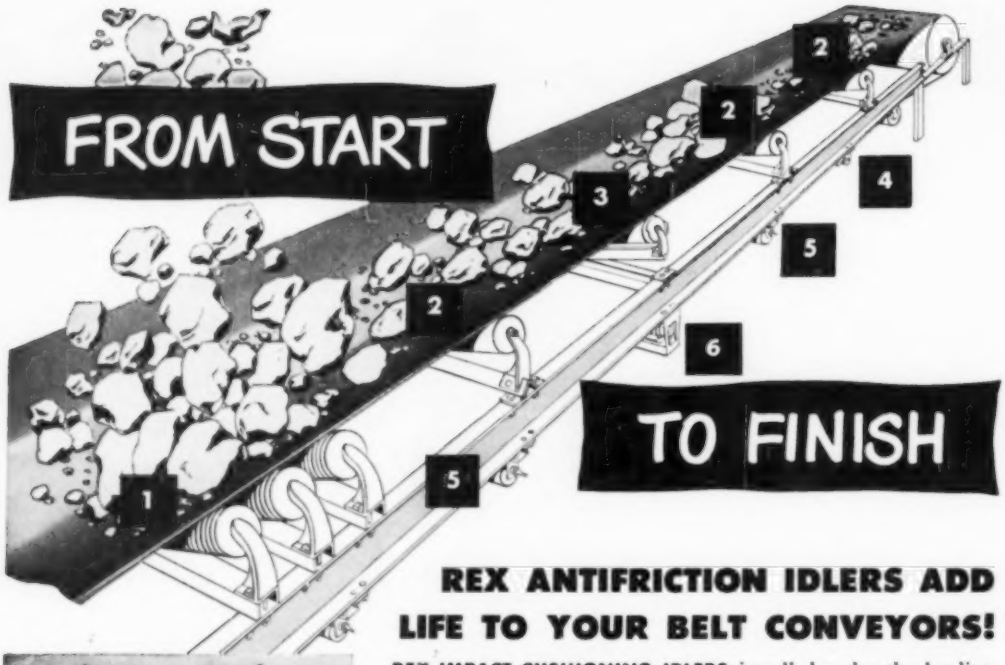
And, he also knows how to best apply this information to your business . . . in terms of good looks, efficiency, and economy!

He is supported by a company with plants strategically located throughout America—to serve you quicker, better. His recommendations are backed by a reserve of experience that dates back to 1847.

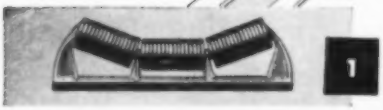
Write today—he'll be glad to help provide a better container for your products.

CHASE BAG CO. GENERAL SALES OFFICES, 309 WEST JACKSON BLVD., CHICAGO 6, ILL.

BOISE • DALLAS • TOLEDO • DENVER • DETROIT • MEMPHIS • BUFFALO • ST. LOUIS • NEW YORK • CLEVELAND • MILWAUKEE
PITTSBURGH • KANSAS CITY • LOS ANGELES • MINNEAPOLIS • GOSHEN, IND. • PHILADELPHIA • NEW ORLEANS • ORLANDO, FLA. • SALT LAKE CITY
OKLAHOMA CITY • PORTLAND, ORE. • REIDSVILLE, N. C. • HARLINGEN, TEXAS • CHAGRIN FALLS, O. • HUTCHINSON, KAN. • CROSSETT, ARK.

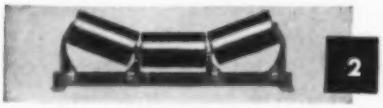


REX ANTIFRICTION IDLERS ADD LIFE TO YOUR BELT CONVEYORS!



1

REX IMPACT CUSHIONING IDLERS installed under the loading points will take the bumps for your belts . . . minimize ruptures and lacerations. Dual-purpose rubber rolls are scientifically molded with deep primary grooves for maximum cushioning and secondary grooves that provide surface softness to avoid belt laceration.



2

REX TROUGHING IDLERS insure minimum service cost and maximum equipment life. Belt friction wear is practically eliminated, and the closely spaced, well-balanced roll units provide an idler assembly that is kind to the belt. There is a type and style for every application.

3

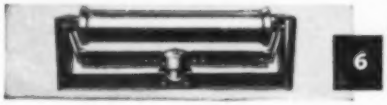
REX SELF-ALIGNING TROUGHING IDLERS automatically align belts without the need for side-guide idlers that impose excessive belt edge wear. They eliminate the misalignments caused by off-center loading, side-wind drifting, warped frames or uneven belt stretch. These idlers fit any belt conveyor frame.

4

REX RUBBER-COVERED SPIRAL RETURN IDLERS create an ever-changing point of contact between belt and idler. Ice, abrasive, corrosive and sticky material cannot build up on the idler and cause premature wear and operating difficulties.

5

REX RETURN IDLERS are dead or live shaft type idlers with hydraulic type fittings for high pressure grease lubrication. They are sturdily built, and their smooth-rolling action cuts belt wear to the minimum.



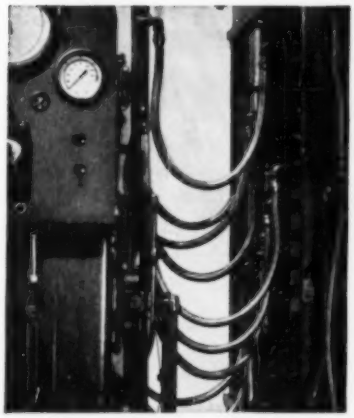
6

REX SELF-ALIGNING RETURN IDLERS assure automatic belt alignment on the return run. They are similar in general design and effectiveness to the Rex Self-Aligning Troughing Idler.

For complete details on these and the many other idlers in the complete Rex line, write for your copy of Bulletin 463-R. Chain Belt Company, 1648 West Bruce Street, Milwaukee 4, Wisconsin.

CHAIN BELT REX COMPANY — BELT CONVEYOR IDLERS

make it **flexible** and pressureproof



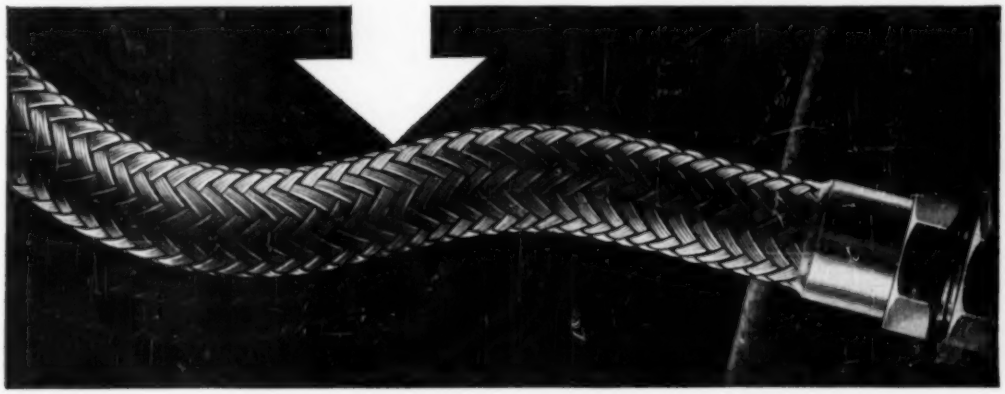
Steam to the moving platens of this hot plate press, made by Williams, White & Co., of Moline, Ill., is carried through these ½" I. D. Bronze American Seamless Flexible Metal Connectors.

Are you plagued with piping that must move, that vibrates, or has connections that are out of alignment?

Whether it carries fluids, gases, semisolids or steam, there's a type of American *Seamless* Flexible Metal Tubing or Flexible Metal Hose to do the job. Neither heat, pressure nor corrosion presents a problem.

American Seamless Flexible Tubing is made of seamless corrugated tubes of bronze and other workable metals, in standard sizes from ⅛" up. They are reinforced with one, two or three pressure-resistant coverings of wire braid. American Flexible Metal Hose is made of spirally wound continuous strips of brass, bronze, aluminum, steel and other metals in ⅛" to 12" I. D. sizes.

For illustrated literature, or the help of our Technical Department, just address The American Brass Company, American Metal Hose Branch, Waterbury 88, Connecticut. In Canada, The Canadian Fairbanks-Morse Co., Ltd.

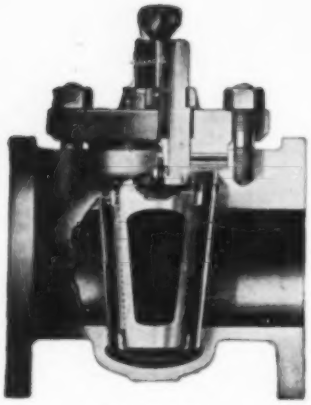


wherever connectors must **move**

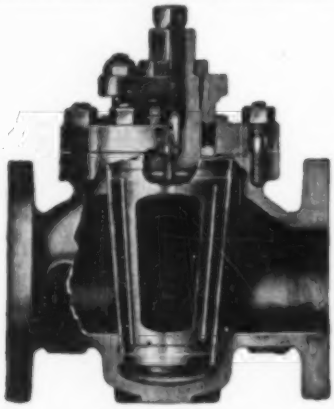
ANACONDA

American

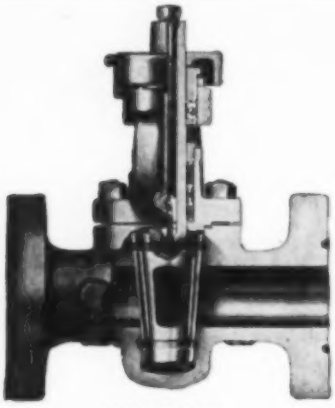
FLEXIBLE METAL HOSE AND TUBING



Single Gland Type



Regular Gland Type



Ball Bearing Type

FOR HANDLING

Acids... Solvents... Sludges...

and other troublesome liquids—

USE WALWORTH LUBRICATED PLUG VALVES

When handling acids, condensates, dyes, oils, solvents, solutions, slurries and hundreds of similar "troublesome" liquids, you get better control, more dependable service and lower operating costs with Walworth Lubricated Plug Valves.

These valves have proved their ability to give easy operation . . . fast action . . . tight shut off . . . greater protection against corrosion. Turning is smooth and easy; just a ¼ turn from full-opening to full-closing. Moreover, Walworth Lubricated Plug Valves are tightly sealed against leaks — *whether open or shut.*

Walworth Lubricated Plug Valves are available in sizes ½" to 24" for pressures from 125 to 5,000 psi, and for vacuum requirement. For further information about Walworth's Complete Line of Lubricated Plug Valves, see your Walworth distributor or write for Catalog No. 46L.

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valves and fittings

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SULPHUR

*Interesting Facts Concerning This Basic Raw Material from the Gulf Coast Region

*MAN MADE MOUNTAINS

Sulphur from the field collecting stations is delivered to the vats through insulated pipe lines which discharge directly on the vats. The sulphur is pumped at such a rate that the height of the vat is increased only a few inches per day, the slight vertical rise being the result of a large horizontal area which provides maximum cooling surface and ample tonnage capacity. As the sulphur solidifies it gradually builds up into a great block or vat of solid sulphur, which may be as large as 1200 feet long, 50 feet high, and 200 feet wide, and containing as much as half a million tons of sulphur.

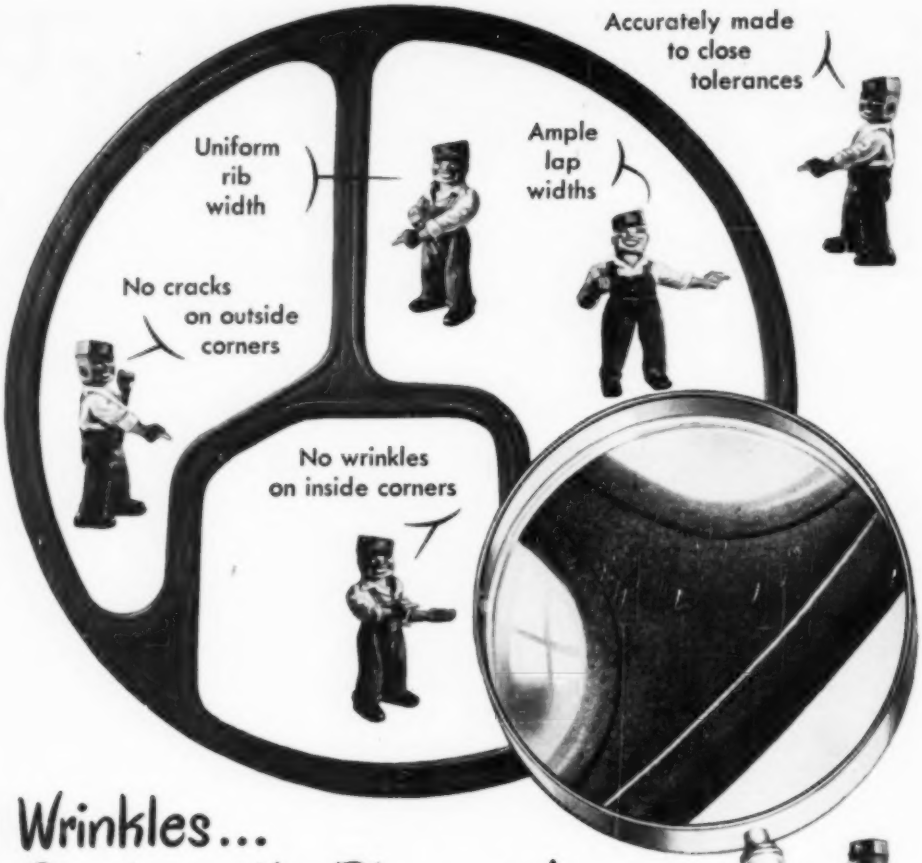
The discharge lines are placed so that the liquid sulphur is spread in an even layer over the entire surface of the vat and is permitted to solidify uniformly. If the liquid sulphur is introduced too rapidly or is not properly distributed, pockets of liquid sulphur will be covered by a crust and remain in the solid sulphur. The low heat-conductivity of sulphur might keep such pockets liquid for a year or more.

Loading operations at one of the huge vats of Sulphur at our Newgulf, Texas mine. Such mountains of Sulphur are constantly being built at our mines, from which shipments are continually made.

TEXAS GULF SULPHUR CO. INC.

75 East 45th St. New York 17, N. Y.

Mines: Newgulf and Moss Bluff, Texas


Accurately made to close tolerances
Uniform rib width
Ample lap widths
No cracks on outside corners
No wrinkles on inside corners

No Wrinkles... No Cracks... No Blowouts!

no place for leaks in THIS heat exchanger gasket

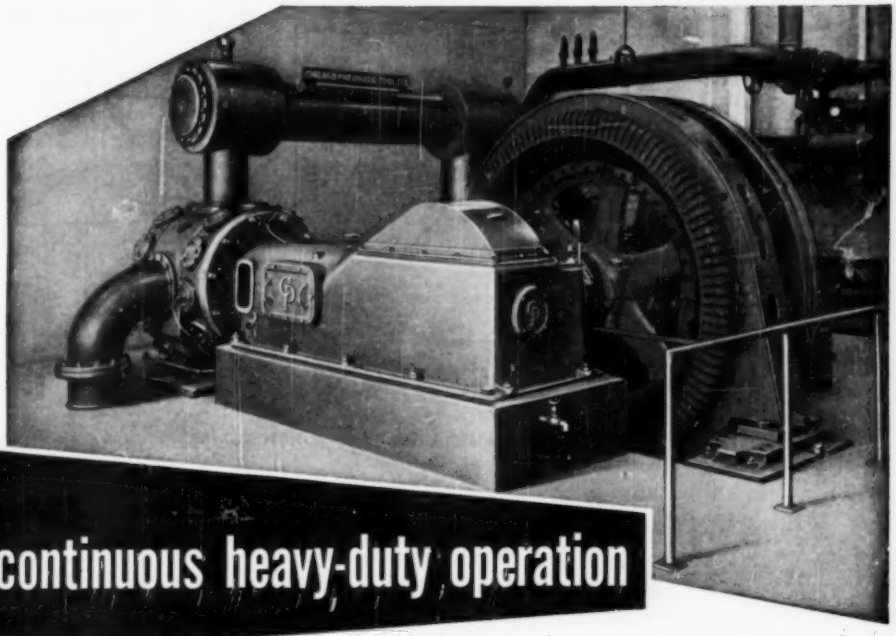
TAKE A CLOSE LOOK at the Goetze heat exchanger gasket shown above. Note the absence of cracks on outside corners . . . of wrinkles on inside corners . . . the uniform width of the ribs . . . the generous overlap of the metal jacket.

Attention to such important details is typical of the kind of care that goes into the forming of these custom-made gaskets. It is the secret of their dependable service—why you can count on them to stay on the job indefinitely without leaks or blowouts. And it's the reason they pay off in terms of less down-time and in the savings that result when gaskets *don't* have to be replaced at frequent intervals.

• • •

You can have Goetze heat exchanger gaskets made in any size or shape. Estimates and recommendations will be furnished promptly on request. Write Johns-Manville, Box 290, New York 16, N. Y.

Johns-Manville *Goetze* Gaskets



for continuous heavy-duty operation

O-CE COMPRESSORS

When the demand is for a continuous, economical supply of air, the CP motor-driven O-CE COMPRESSOR is unsurpassed.

Quick-acting Simplate valves minimize power consumption and provide high volumetric efficiency. Large, stream-lined air passages make air flow resistance negligible. CP Multi-Step Control handles partial load demands economically. CP Intercooler assures maximum heat transfer with low water consumption. CP Automatic Starting Unloader completely unloads compressor when starting and stopping.

The CP heavy-duty, conservatively rated Class O-CE Compressor is of the horizontal, double-acting, water-cooled type, with direct-mounted synchronous motor drive; in sizes up to 1,750 h.p., for pressures up to 5,000 pounds.

Write for full information.

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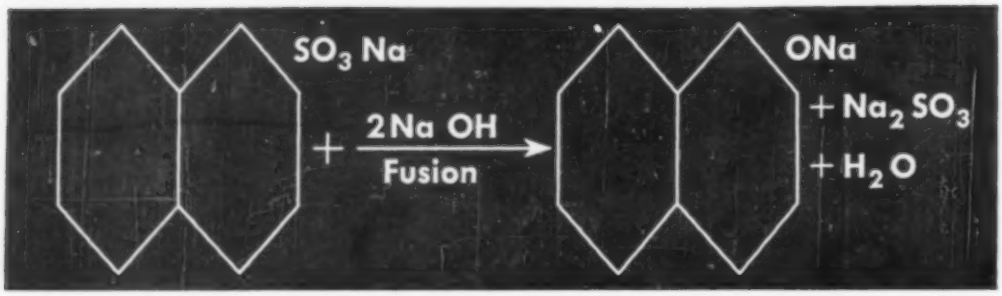
General Offices: 8 East 44th Street, New York 17, N. Y.

ELECTRIC TOOLS • PNEUMATIC TOOLS • AIR COMPRESSORS • ROCK DRILLS
DIESEL ENGINES • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

How to make LONGER-LASTING EQUIPMENT for Anhydrous Caustic Processing



***Nickel* may solve your corrosion problems in caustic fusions or continuous production of anhydrous caustic**

For many years, the chemical industry has regarded Nickel as the *standard* metal for caustic handling equipment.

Pure Nickel, and Inconel*, as well as Lukens Nickel-Clad Steel, offer excellent resistance to the hot alkali, and reduce the possibility of contamination through excessive metal pickup. In addition, these metals are easy to fabricate and can be joined with corrosion resistant welds.

For these reasons, users of caustic fusion processes have followed the lead of caustic soda producers—and turned to Nickel and Inconel* as materials for processing equipment.

Continuous processing, whether to produce anhydrous caustic, or in a caustic fusion process, may make severe demands on equipment. The combination of properties available in Nickel and Inconel recommend them for these continuous units. Both show high corrosion resistance to hot caustic and commonly encountered organic chemicals.

If you are concerned with corrosion problems arising from caustic fusion or continuous anhydrous caustic production—consult our Corrosion Engineering Service. A large fund of up-to-the-minute experience data is yours for the asking.

IMPORTANT NEWS ABOUT INCONEL

As a result of recent investigation, Inconel has proved to be of significant value for certain applications involving hot caustic soda. If you would like full information on these recent findings, write now to our Corrosion Engineering Service.

EMBLEM OF SERVICE
INCO
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USE PURE Nickel WHERE PURITY COUNTS

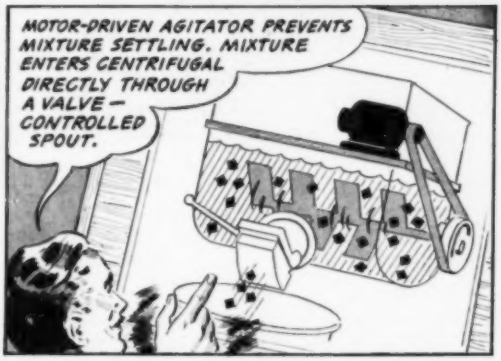
THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

*Reg. U. S. Pat. Off.

Combining a centrifugal with a mixing tank did away with trouble-making time lag

ANOTHER **A.T.&M.** SUCCESS STORY BY *Sam Spinner*

SAM, THIS COMPOUND IS A PROBLEM. THE SLIGHTEST TIME LAG BETWEEN MIXING AND CENTRIFUGING CAUSES IT TO SETTLE. RESULTS ARE BAD.
I BELIEVE I CAN SOLVE THAT, JOE...


MOTOR-DRIVEN AGITATOR PREVENTS MIXTURE SETTLING. MIXTURE ENTERS CENTRIFUGAL DIRECTLY THROUGH A VALVE—CONTROLLED SPOUT.

2 MONTHS LATER
RESULTS ARE PERFECT, SAM! NO MORE TROUBLE WITH THAT COMPOUND. THE NEW TANK ARRANGEMENT DOES AWAY WITH TIME LAG.
YOU CAN COUNT ON A.T.&M. TO PROCESS CHEMICAL JOBS FASTER, BETTER, AT LESS COST.

Let us bring you up to date on what modern centrifuging can do JUST MAIL COUPON NO OBLIGATION

SAVE TIME, SPACE AND COSTS WITH

A.T. *and* M. CENTRIFUGING

AMERICAN TOOL & MACHINE COMPANY
1415 Hyde Park Ave., Boston 36, Mass.

Please send information on centrifuging applied to the following processes:
☐ Extraction ☐ Filtration ☐ Dehydration ☐ Coating ☐ Precipitation
☐ Sedimentation ☐ Impregnation

Write here any other process .....

Name ..... **Title** .....

Company .....

Street .....

City ..... **Zone** ..... **State** .....

This is Why the Nash is the Most Simple Compressor

It's the Nash!

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs. pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods. Data on these pumps sent immediately on request.

No internal wearing parts.

No valves, pistons, or vanes.

No internal lubrication.

Low maintenance cost.

Saves floor space.

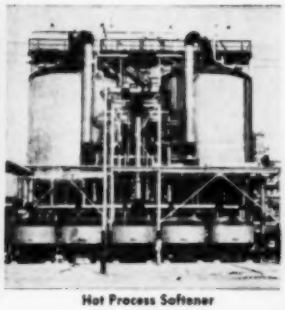
Desired delivery temperature automatically maintained.

Slugs of liquid entering pump will do no harm.

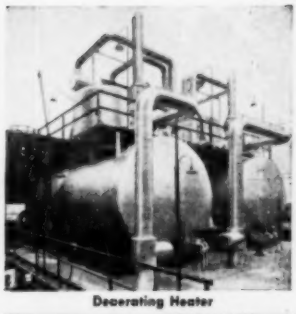
75 pounds in a single stage.

NASH ENGINEERING COMPANY
325 WILSON, SO. NORWALK, CONN.

Zeolite Softener

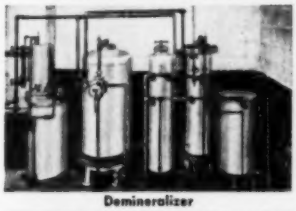


Hot Process Softener

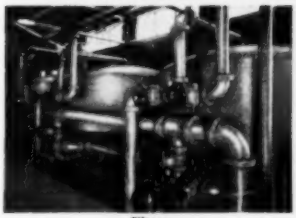


Deaerating Heater

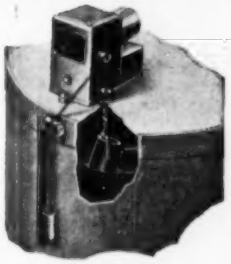
Reactivator Cold Process Unit



Demineralizer



Filters



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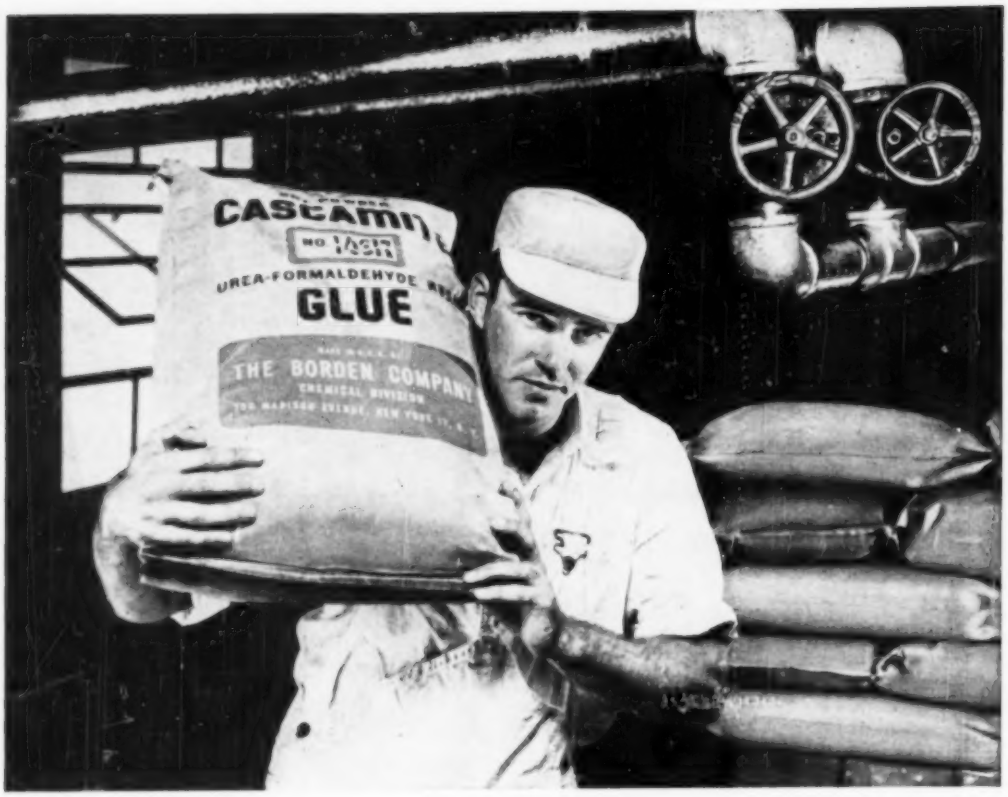

POLYTHENE-LINED PAPER BAG PROTECTS MOISTURE-SENSITIVE GLUE

Multiwall bag with a polythene-coated ply has improved resistance to atmospheric moisture over a wide range of temperatures...plus many other advantages

WHEN The Borden Company needed an economical, damp-proof package for a very hygroscopic powdered resin glue, they chose a sturdy, lightweight, inexpensive multiwall paper bag, one layer of which has a thin coating of Du Pont polythene plastic. These bags keep moisture out during handling and shipping, protect contents until used. Compared with many other types of containers, the empty bags save up to 91% of storage space—save shipping costs, too.

The use of paper coated with Du Pont polythene in multiwall bags provides these advantages:

- **better protection against moisture**
- **better chemical resistance**
- **better strength**
- **better grease resistance**

These characteristics are retained over a wide range of temperatures. The use of a polythene-coated ply also offers greater versatility, since film thickness can be varied to meet specific requirements.

Many other "hard-to-pack" products are being successfully shipped in these bags, including calcium chloride, dry milk, meat trimmings, sodium bisulfite, benzene hexachloride, quicklime, various synthetic resins.

The multiwall bag is only one of many new packaging applications of polythene. The new coating technique used here is a joint development of St. Regis and Du Pont technical men. Du Pont representatives will gladly work with extruders, molders, or converters, or will suggest suppliers who can meet specific needs for packaging or other uses of plastics. Write today for free literature on polythene and other versatile Du Pont plastics.

(Multiwall bag made by St. Regis Paper Co., New York, New York.)

E. I. du Pont de Nemours & Co. (Inc.), Plastics Department, Main Sales Offices: 350 Fifth Ave., New York 1, New York; 7 S. Dearborn St., Chicago 3, Illinois; 845 E. 60th St., Los Angeles 1, California.

DU PONT
REG. U.S. PAT. OFF.
Plastics
BETTER THINGS FOR BETTER LIVING
THROUGH CHEMISTRY

In advertisements like this, reproduced from The Saturday Evening Post, Barrett builds public interest in the products you make—products that contain Barrett Coal-tar Chemicals—products that contribute to raise the standard of American living.

At the other end of the television tube...

At the back end of your television tube—the end you never see—there's a little cap with an interesting job to do.

This is where all the "strings" are finally tied together and electronics starts to become entertainment. In go the electrons and out comes the picture!

This hardworking little cap is made of plastic. So are hundreds of other essential gadgets that help make television work. From the studio to your set, television travels a road that is paved with plastics.

Barrett supplies *phenol* from which many of these plastics are made. It also supplies plasticizers to make them tough. These are only a few of the many Barrett basic products which add to the fun, comfort and convenience of life in modern America.

THE BARRETT DIVISION
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- "ELASTEX" 10-P Plasticizer
- "ELASTEX" 50-B Plasticizer
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- Niacin (Nicotinic Acid)
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- Picolines
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- Neutral Coal-tar Oils
- Coal-tar Creosote
- CUMAR* Paracoumarone-Indene Resin
- Carbonex* Rubber Compounding Hydrocarbon
- Bardol* Rubber Compounding Oil
- Flotation Agents

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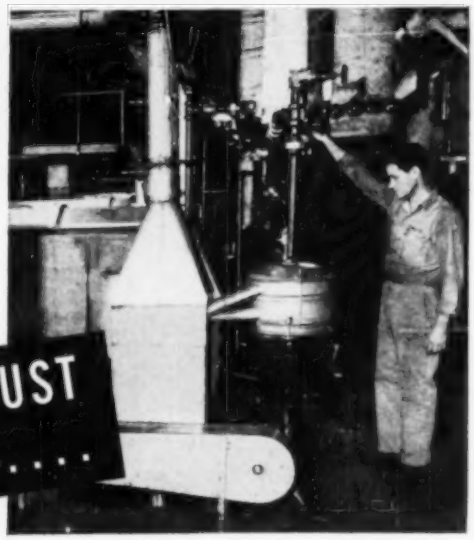
ANOTHER

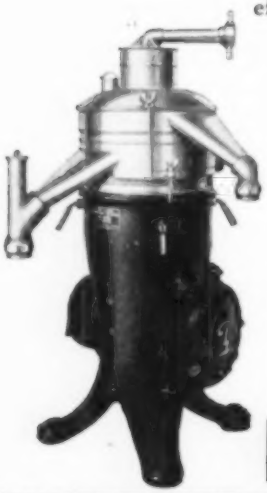
INTERESTING JOB FOR CENTRIFUGAL FORCE



REMOVING ALMOND DUST FROM NUT OIL.....

At Hershey Chocolate Corporation, De Laval Clarifiers remove the very fine powdery substance natural to almonds from the cocoa butter oil in which the nuts are roasted. Likewise butter from the peanut roasting operation is clarified by centrifugal force.

The application is not new—the De Laval machine shown in the foreground is an "old-timer"—but it points up the fact that when the job calls for continuous removal of a solid from a liquid, or for the continuous separation of two liquids, often nothing is so effective as De Laval centrifugal force.



In many processes, not only is the act of separation speeded up and made continuous, but also the product itself is improved or made "as good as new." It's true of cocoa butter,—it's true of many other things. You might be well repaid for investigating the possibilities of using centrifugal force in ***your own plant***. De Laval has the machines in types and sizes to answer just about every centrifugal problem.

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

DE LAVAL CENTRIFUGAL PROCESSING SYSTEMS

FOR SEPARATION • CLARIFICATION • CONCENTRATION

SOLVENT VAPOR DRYING PROCESS DRIES WOOD IN HOURS WITHOUT DETERIORATING EFFECTS

Heretofore wood has been dried in open air, by steam, or by high temperature air. Open air drying takes 6 to 18 months; steam and high temperature air often result in hydrolysis or burning. Now, one of the country's largest wood preserving plants has developed a Vapor Drying process which safely and effectively dries wood in from *6 to 14 hours!* The drying agent used is *Esso's Solvesso Xylol.*

The drying process begins when a locomotive pushes a charge of crossties, approximately 100 feet long, into a cylinder or drying chamber. At the proper time, vaporized Solvesso Xylol is passed into the drying cylinder. The hot Solvesso Xylol vapor is circulated through the cylinder for a few hours, penetrating many inches into the wood and evaporating much of its moisture.

As "dry cleaning" and moisture evaporation continue, the solvent vapor with its moisture-lignin content leaves the cylinder and is condensed, separating the solvent from the water in the settling tank and returning the Solvesso Xylol to the evaporator to be reused. (see diagram)

5 Gallons of Water from One Crosstie

The amount of water removed from the settling tank determines the relative dryness of the wood being treated. When drying is finished, the Solvesso Xylol lines are closed, the chamber evacuated and the wood is ready for treatment with wood preservative. Water from the settling tank is passed through a meter, which is read periodically to determine wood drying progress. One charge of 800 crossties may be made to give up as many as 4,000 gallons of water—or *5 gallons per crosstie*—in a 12-hour drying period.

Esso Solvents Play Vital Role in Scores of Industries

Rubber, textiles, chemicals, paper, food, leather and scores of other industries are utilizing the many types and grades of solvents manufactured by Esso Standard Oil. Production men know they can rely on Esso Petroleum Solvents' purity and uniformity, maintained through most modern and stringent refinery treatment. If you have a solvents problem, let our technical men examine your requirements and determine the solvent best suited to your needs. Drop a line today to our office nearest you.

Paper Mill Machinery now Cleaned with Solvesso 100

Solvesso 100 is now being used to clean paper machine screens and felts when they become congested with natural wood pulp gums and resins. Since paper machines are operated at extremely high temperatures, Solvesso 100's high flash point (over 100°F.) makes it ideally suited. In addition, Solvesso 100 has especially high solvency for resins since it contains more than *95% petroleum aromatics.*

Before they were creosoted, the crossties in this picture were dried by a new vapor process employing Solvesso Xylol.

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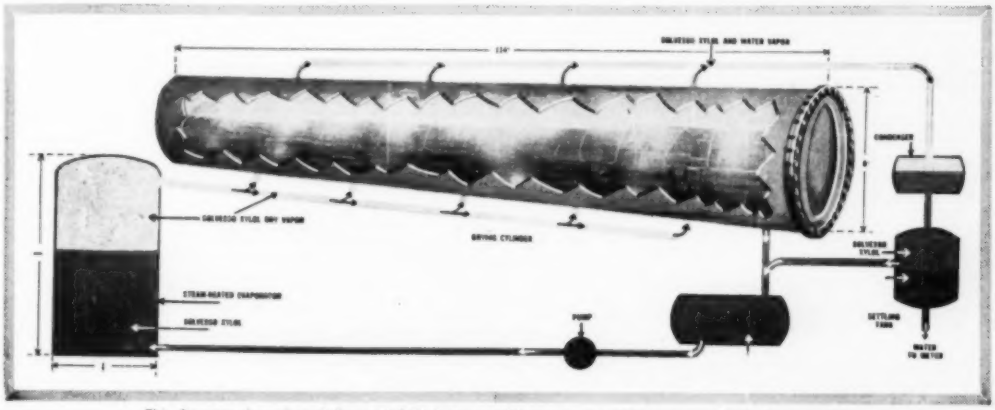
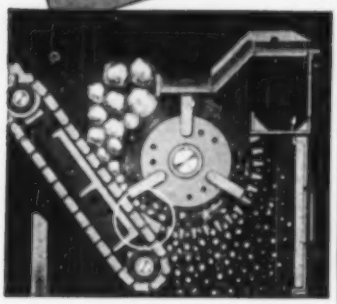


This diagram shows how Solvesso Xylol is being used in new vapor drying process for drying crossties.

THE ONE and ONLY NON-CLOG The tried and proven DIXIE HAMMERMILL



Extended Moving Breaker Plate construction (illustrated) guards against passage of oversize material . . . results in improved grinding control

Your Assurance of Greater Production at Less Cost

The one and only Dixie NON-CLOG Moving Breaker Plate Hammermill* sets a new standard of crushing efficiency in the reduction of wet, sticky materials.

If you have wet, sticky material to crush, if you have difficulty in reaching and maintaining desired production, if you have any crushing problem at all, it will pay you to take advantage of this vastly improved crushing principle.

Dixie Non-Clog Hammermills are made in sizes ranging from 24" up to 72" diam.

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* U. S. Patents Granted & Pending

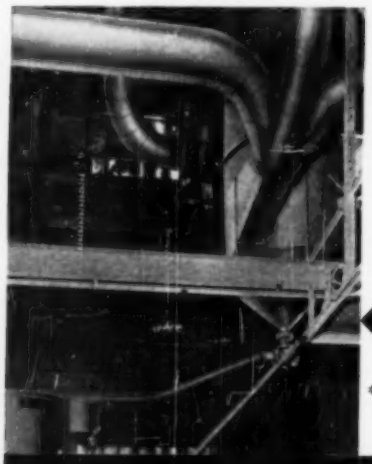
DIXIE

MACHINERY MFG. CO

Main Office and Plant
4172 Goodfellow Ave., St. Louis 20, Mo.

*HC MULTI-WASH UNIT

COLLECTS VALUABLE MATERIALS . . . CONTROLS DUST AND FUMES!



First! Schneible Engineers were first to introduce the *wet method of dust collecting* to successfully salvage valuable by-products, and to eliminate the hazardous, health-damaging dust and fumes from chemical plants.

Proof! A great many installations have been made in the chemical and manufacturing industries . . . as many as 55 units for a single company . . . proof positive that the *Schneible* Multi-Wash Method of controlling dust and fumes and by-product collection is economical and effective . . . proof of highly satisfactory performance!

CLAUDE B. SCHNEIBLE COMPANY
2827 Twenty-Fifth St. Detroit 16, Michigan

This 10,000 cfm capacity Schneible Multi-Wash Collector removes dust from a lime processing plant. A Skinner Tank Dewatering Unit is coupled with the dust collector.

* MODEL HC—1500 to 30,000 c.f.m., or multiple units for larger capacities.
MODEL JC—1000 to 30,000 c.f.m. or in multiple units.

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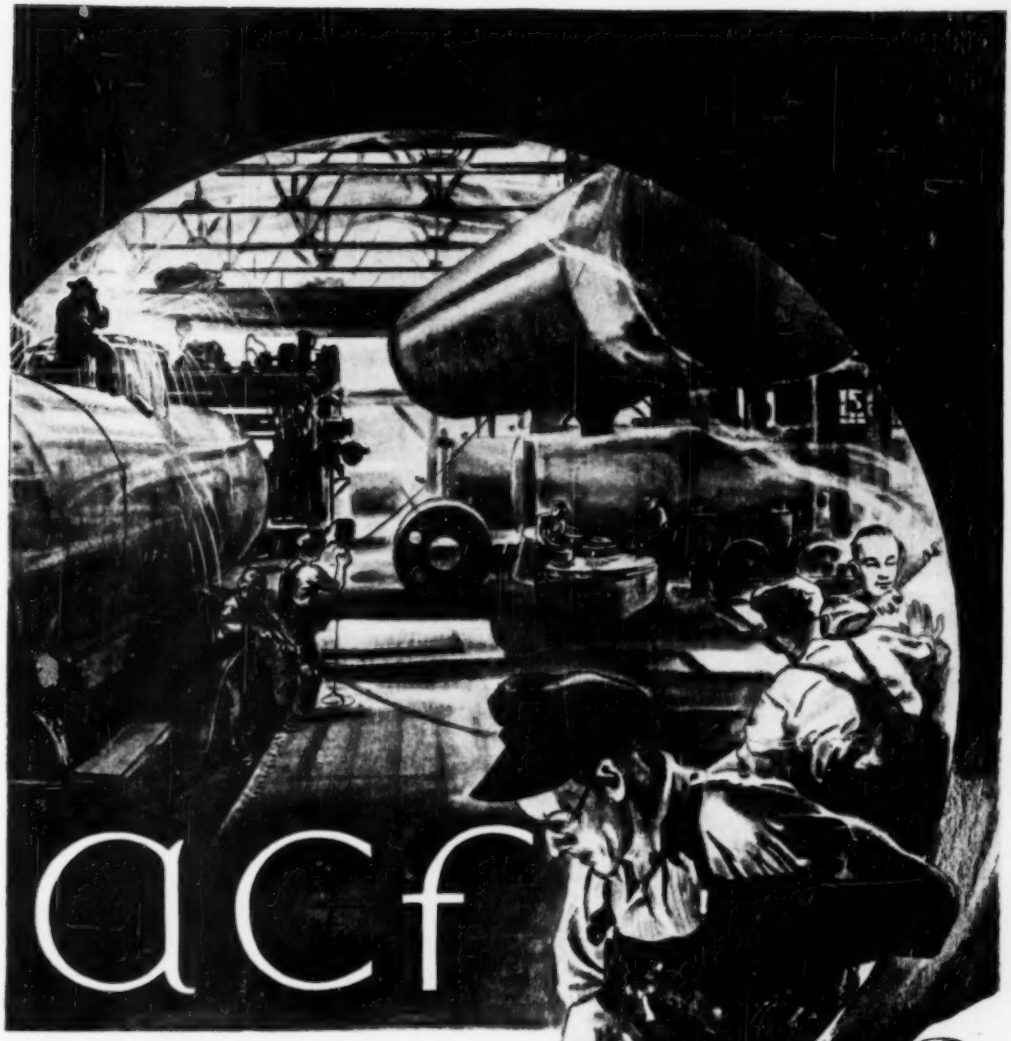

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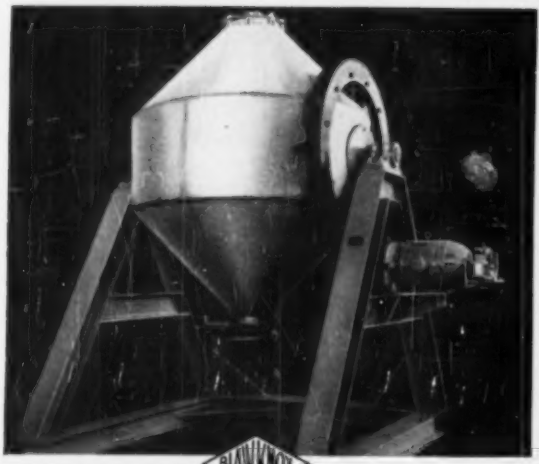

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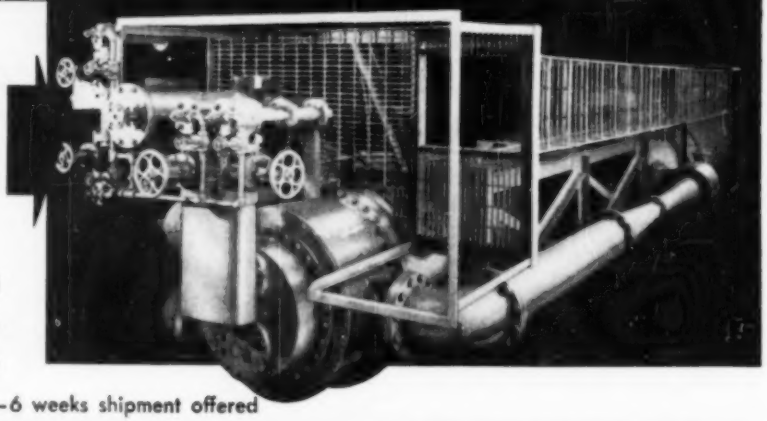

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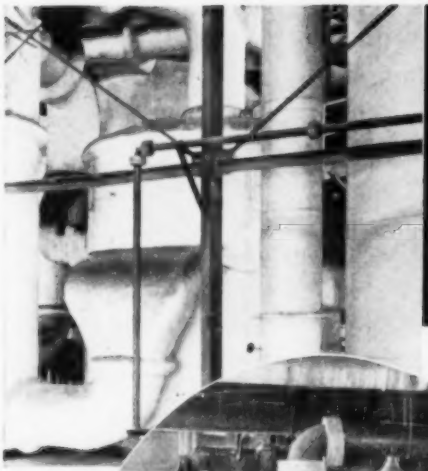

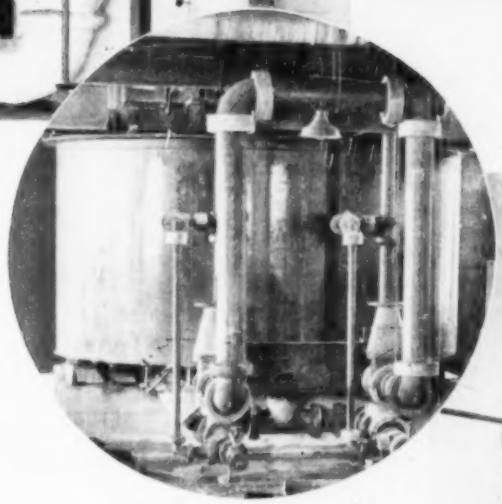

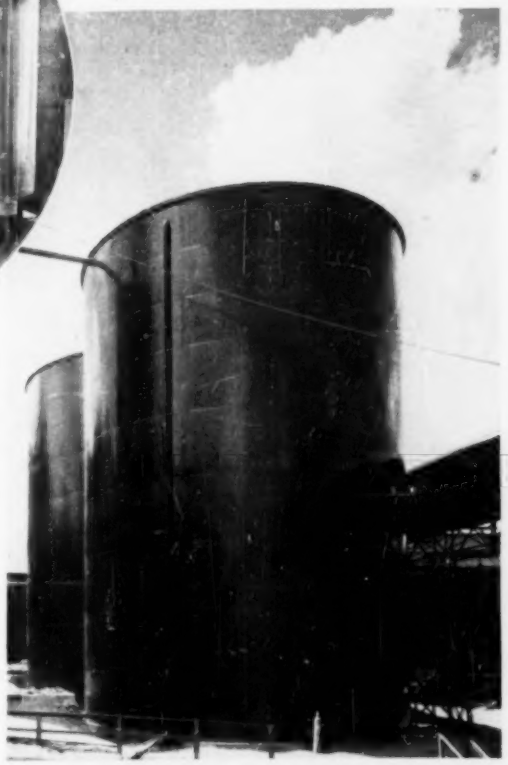

Top: A 16-ft. diam. by 18-ft. 7½-in. converter at a sulphuric acid contact plant in Garfield, Utah.

Left: One of two 13-ft. diam. by 7-ft. high brick lined receivers for concentrated sulphuric acid at the same plant.

Below: Two 45-ft. diam. by 66-ft. high water storage tanks at the anode casting plant also in Garfield.

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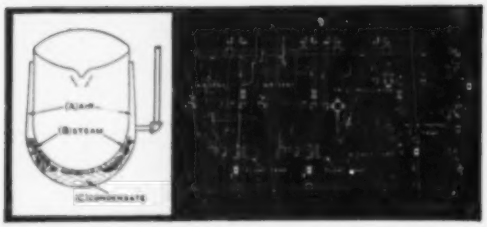

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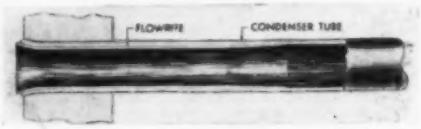

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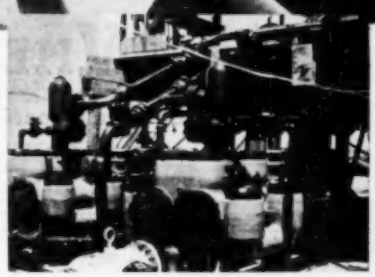

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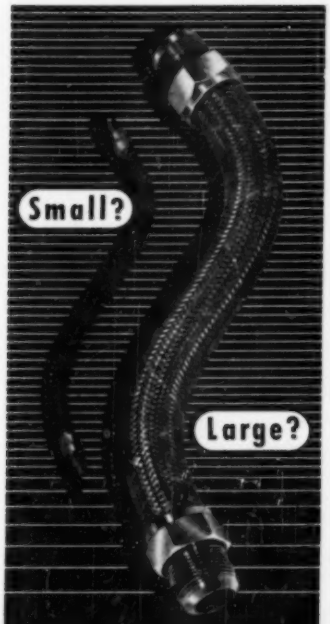

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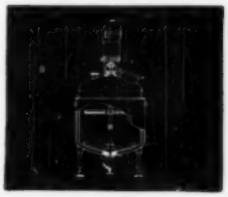

A Kettle with modified paddles

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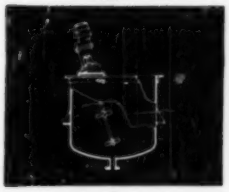

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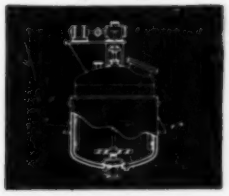

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Established Los Angeles-San Francisco organization of professional sales engineers selling top lines of equipment can handle additional accounts. Centrally located offices with service and warehouse facilities. Coverage includes refinery, chemical, power, aviation, and municipal sales. Write

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In Chicago, Ill., on Chicago Sanitary District Canal, at Harlem Ave. Access to Great Lakes and Mississippi River. Barge unloading and tank car or truck loading facilities. Tank space available. Will build to suit your needs.

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All types crude mixtures
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High Temperature High Vacuum
Simple Distillation Difficult Fractionations
Separation of close-boiling liquids, isomers, and azeotropes our specialty
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RARE METALS CO.
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Wanted Advertising—page 367

Christmas
comes but once a year . . .
BUT
GELB
GIVES
YEAR-ROUND VALUE

THE GELB GIRL—DECEMBER 1949

1—Sperry 24" Stainless Steel Filter Press, closed delivery, 12 chambers with hydraulic closing.
1—Sperry S.S. Filter Press, 12" x 12", 15 chambers.
1—Shriver 42" x 42" Filter Press, 46 chambers with hydraulic closing.
1—Sperry Plate & Frame Al. Filter Press, 18" x 18".
1—Shriver Bronze plate and frame Filter Press, 18" x 18".
1—Sperry Rubber-lined Filter Press, 12" x 12", recessed type, closed delivery.
1—Sperry 24" x 24" Filter Press, closed delivery, 12 chambers.
3—Shriver Plate and Frame Lab. Filter Presses, 7" x 7".

1—Shriver 36" x 36" Filter Press, closed delivery.
1—Vallez #3 Filter.
1—Shriver 42" Skeleton.
1—Sparkler Filter, Model 18-D-8.
2—Sweetland #5 Stainless Steel Filters. (New)
1—Sperry 36" x 36" Recessed Type Filter, center feed, open delivery, 42 Heresite covered plates.
2—Black & Clawson Double Drum Dryers, 28" x 5'.
1—Bartlett & Snow direct fired Kiln, 8½' x 50'.
1—Ruggles Cole direct fired Kiln, 7' x 60'.
1—Buffalo Double Drum Dryer, 36" x 72", chrome plated drums.
1—Banbury Mixer #1 with 50 HP motor.
4—Baker Perkins Jacketed Vacuum Type Double Arm Mixers, w/motors and drives, 600# capacity.
3—Cavagnarro Vacuum type Double-arm Mixers w/motors and drives, 600# capacity, Stainless Steel.
1—J. H. Day double arm, jacketed Mixer, sigma blades, 500 gallons.
3—J. H.Day double arm, jacketed Mixers, 50 gals., sigma blades.
1—Baker Perkins double arm jacketed Mixer, 200 gals., sigma blades.
5—Baker Perkins double arm Mixers, 200 gals., sigma blades.
1—J. H. Day Lab. Type Mixer.
1—Patterson nickel lined Blender, 192 cu. ft. cap., w/20 HP Motor.
2—J. H. Day Mogul type Mixers, 2½ gallons & 5 gallons.
1—J. H. Day type M B D Stainless Steel Kneader, 12 gallons.
5—Simpson #0 Intensive Mixers (New)
1—Bird Suspended type Centrifuge. 40" Stainless Steel perforated basket, with motor.
1—Tolhurst Suspended type Centrifuge, 40" rubber perforated basket, with motor.
1—Podbielniak Stainless Steel Centrifugal Extractor, Model 6080.
10—Sharples Super Pressure Centrifuge, with 3 HP Expl. proof motors.
1—Sharples Super Pressurite Centrifuge, SS Bowl, Model 18V
1—A T & M Suspended type Centrifuge, 30", Stainless steel perforated basket, with motor.
1—Tolhurst Suspended type Centrifuge, 26", Stainless steel perforated basket, with motor.

2—Buflovak Vacuum Drum Dryers, 24" x 20".
2—Buflovak Vacuum Drum Dryers, 5'10" x 10'.
2—Louisville Rotary Steam Tube Dryers, 6' x 50'.
1—Louisville Rotary Steam Tube Dryer, 54" x 30'.
2—Buffalo Double Door Vacuum Shelf Dryers, 12 & 14 shelves.
3—Buffalo Flakers, 5' x 12'.

1—Royle #1 Perfected Extruder, with heating unit.
1—Allis Chalmers Ball Mill, 5'8" x 18', Silex lined.
3—Hardinge Conical Ball Mills, 8' x 30", 5' x 22", 6' x 22".
1—Royle #½ Perfected Extruder, with heating unit.
1—Kettle 300 gallons, with Mixer (ASME).
1—Plate Fabricator, jacketed Kettle, 900 gallons, 125 PSI (ASME).
1—Steel Jacketed Kettle, 7'3" x 7'.
1—Cast Iron Jacketed Kettle, 300 gallons.
2—Pfaudler 500 gallon glass lined storage tanks (Horizontal).
1—Buffalo Cast Iron Jacketed Kettle, 600 gallons, with mixer.
1—Blaw-Knox jacketed Autoclave, 3' x 4'2", with agitator.
1—Patterson Jacketed Autoclave, 3' x 3'9".
2—Alloy Fabricators, S. S. jacketed Reaction Kettles, 170 gallons with agitator and motor.
1—Stainless Steel Direct Fired Still ,6" x 6", with coils and agitator.
1—Steel Storage Tank, 10,000 gallons, 1" plate.
2—Steel Pressure Tanks, 4' x 11', 200 PSI.
1—Patterson 5,000 gallon mixing Kettle (New).
1—Glasscote 1,000 gallon glass lined Jacketed Reactor (New).
2—Pfaudler Aluminum Jacketed Reactors, 1300 gallons & 250 gallons (New).
3—Stainless Steel Jacketed Kettles, 30" x 3'.
1—#6 Mikro Atomizer, Stainless Steel, w/20 HP Motor.
1—Mikro Pulverizer, #2TH
1—Mikro Pulverizer, #1SH
1—Fitzpatrick Style D Comminuting Machine.
1—Ball & Jewell Rotary Cutter, #½.
1—Ball & Jewell Rotary Cutter, #2.
1—Ball & Jewell Rotary Cutter, Lab. Type.

Established 1886

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CHEMICAL, RUBBER, OIL, PLASTIC and FOOD PROCESSING MACHINERY

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Burt Automatic Wraparound Labelers.

Colton and F. J. Stokes Late Style Rotary and Model T Tablet Machines.

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Triangle SHA Auto. Net Weigher with High Speed Adj. S.A. Carton Sealer.

Standard Knapp No. 429 Carton Sealer, 10 and 18 ft. Compression Units.

Package Machy. FA, DF & FA2Q Wrappers.

Hayssen 3-7 and Scandia SSU1 Automatic Cellophane Wrappers.

Mikro 4TH, 2TH and 1SH, Jay Bee 3AT and U1, Schutz-O'Neill, Stedman Mills.

Rietz 12" and 18" Disintegrators.

Baker-Perkins and Readco Heavy Duty 100-150 gallon Double Arm Jacketed Mixers with Sigma or Fish Tail Blades.

F. J. Stokes, J. H. Day, New Era, Hottman Mixers, from 2 gallons up to 450 gallons with and without Jackets, Single and Double Arm Agitators.

Day & Robinson 100, 800, 2000, 2400, 4000 lbs. Dry Powder Mixers & Sifters.

J. H. Day 8 gal. Pony Mixer, motor driven.

Huhn Steam & Gas Fired Rotary Dryers.

Hersey 6' x 23' Rotary Steam Dryer.

Kent Three Roll Roller Mills, 12" x 30" and 16" x 40" sizes.

Houchin Aiken 2000 lb. Soap Crutcher.

Houchine Aiken and N.E. Soap Mills.

Schutz-O'Neill #3 Sifters and Gayco 8' Air Separator.

Pony MX Duplex and ML Labelrites, World Semi and Fully Automatic Rotary and Straightaway Labelers.

Horix, International Stainless Steel Rotary Fillers, Elgin 24 Head Rotary Filler.

Ertel 12 Head Semi Auto Vacuum Filler.

Sweetland, Vallez, Sperry, Shriver, Johnson and Republic Filter Presses.

Filler 1, 2, 4, & 8 head S.S. Piston Filters.

MANY OTHER ITEMS OF INTEREST IN STOCK

WRITE, PHONE, WIRE COLLECT FOR DETAILS AND PRICES ON YOUR REQUIREMENTS

Union **STANDARD EQUIPMENT CO.**
318-322 LAFAYETTE ST., NEW YORK 12, N.Y.

TOP PRICES PAID FOR YOUR SURPLUS EQUIPMENT

GET QUALITY WITH AMERICAN — THE BEST IN REBUILT COMPRESSORS— SAVE 40% TO 60%

STATIONARY

CFM	Max. Pres.	Size	Make
26	150	4x4	INGERSOLL ERI
44	110	5x4	INGERSOLL ERI
44	150	5x5	INGERSOLL ERI
66	110	6x5	AM-ER-PA-WORTH
69	125	6x6	IR-CPT
69	250	6 3½x6	INGERSOLL ER2
85	40	6 6x5	INGERSOLL 67x9
88	80	7x5	INGERSOLL ER1
93	100	7x6	AM-CPT-IR
103	100	7½x6	CHICAGO NSB
120	80	7x8	PA-IR
129	100	7½x7	AMERICAN AP1
130	125	8x6	CPT-IR
143	60	9x6	PA-IR
161	60	8x7	WORTH HB
173	100	9x6	IR-CPT-SULLIVAN
225	70	10x6	IR-PA
240	100	10x9	PENN
254	125	10x10	IR-CPT
270	125	SULLIVAN "UNITAIRE" 12x6	IR
273	15	11x10	WORTHINGTON
315	50	12x8	IR-CPT
286	40	12x9	PENN
340	50	12x9	PENN
350	125	11x12	WORTHINGTON
358	100	12x10	IR-CPT-PA
358	150	12 7½x10	PENN
366	125	12x12	CPT-IR
368	125	7 7 8x5	WORTHINGTON VS-72
466	125	12 7x8	CHICAGO O-CB
477	35	14x9	PENN
528	100	14x12	IR-CPT-GD
577	30	15x10	PENN
665	40	16x10	PENN

PORTABLE

17 CFM—25 CFM—30 CFM Lindsay
60 CFM Chicago (gas) 2 Pneu.
60 CFM Ingersoll (gas) 2 Pneu.
105 CFM Sullivan (gas) skids
105 CFM Worthington (gas and diesel)
105 CFM Ingersoll (gas) 4 Pneu.
180 CFM Worthington (diesel) 4 Pneu.
210 CFM Gardner Denver (gas) 4 Pneu.
210 CFM Worthington (gas and diesel)
315 CFM Worthington (gas) 4 Pneu.
315 CFM Chicago (diesel) 4 Pneu.
315 CFM Ingersoll (diesel) 4 Pneu.
500 CFM Worthington (diesel) 4 Pneu.
500 CFM Chicago (diesel) 4 Pneu.

VACUUM PUMPS (DRY)

67 CFM—Worth—Two stage
134 CFM—Worth—single Stage
250 CFM—Worth (Vertical) 12 x 6
364 CFM—Penn—14 x 5
720 CFM—Ingersoll Rand ERI 10 x 7
1080 CFM—Ingersoll Rand ERI 22 x 8
2925 CFM—Ingersoll 32 x 13

3000 Lbs.
Ingersoll Rand Type 40, 4 steps base mounted 110 CFM—40B HP—Two Available

1000 Lbs.
Worthington Type 482—8-M-14 61 CFM 10.6 HP base mounted with motor.

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NORTH BERGEN
NEW JERSEY
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TRY this NEW EQUIPMENT HOUSE

ONE letter, wire or telephone call gets you the answer you want whether you are seeking one machine or have a complete plant for sale.

Stainless Steel Hi-Pressure Jacketed Agitated Autoclave, 75 gal., 1000 PSI.

3 Stokes Rotary D3 Tablet Machines.

Watson Stillman 2500 lb. Hydraulic Accumulator with 20 H.P. motor.

Stokes Lab. Vac. Shelf Dryer.

4 Hor. Retorts, up to 20' long.

Dry Mixers, 200 to 10,000 lbs.

Do Mixers, 1 to 6 bbl.

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OIL & ACID TANKS

8—25,000 gal. Horiz. 10'6" x 38'8" Shell ⅜"
1—10'9" x 30', 2—10'9" x 19'9", 1—9'8" x 34' all ⅝ in. Shells Butt Welded Horiz.
8—74,000 bbl. Vert. 114' dia. 40' high
6—12,000 & 15,000 Cap. Horiz.
50—New 10,000 gal. Horiz. 60 lb. Test

LESTAN CORP., ROSEMONT, PA.

MOTORS, GENERATORS, TRANSFORMERS
1 — 1500 H.P.
Bought and Sold
New and Rebuilt
ELECTRIC EQUIPMENT CO.
ROCHESTER 1, N. Y.

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A FEW SELECTED ITEMS IN STOCK

1—6' x 4' Oliver all Stainless Steel Top Feed Rotary Continuous Vacuum Filter. UNUSED. Never installed. Intended to filter ammonium sulphate.

2—#12 Sweetland Pressure Filters drilled on 2" and 4" centers.

5—Foote Bros. Type 8HGV Worm Reducers, Ratio 6.33-1, with or without 10 HP 3/60/220-440V. 1750 RPM Motors.

1—8' x 125' Reeves Rotary Kiln.

1—2' x 15' Rotary Kiln, experimental, complete.

2—6' x 12' Allis Chalmers Rod Mills.

1—#4 TH Mikro Pulverizer Rebuilt—available for immediate shipment.

2—200 Gal. Patterson Pebble Mills, 4'x5', Burrstone lined with drives and motor.

1—#1 Banbury Mixer, chrome plated rotors, with drive and 40 HP Motor.

1—Louisville Rotary Steam Tube Dryer 6' x 50'.

1—Rotary Vacuum Dryer 5' x 33'.

1—Vacuum Shelf Dryer, 17 Shelves, 40' x 43".

3—7500 gal. Closed Steel Kettles, 10' dia. x 12'6" deep, with Copper Coils, Closed. Bronze Propeller Agitators, Enclosed Motor Driven Worm Gear Drives.

5—Modern Engineering Co. RVD8 Enclosed Worm Reducers, Ratio 6.43-1, with or without 10 HP 3/60/220-440V 1750 RPM Motors.

2—Baker Perkins Mixers, Size 17, Jacketed, 200 gal.

1—Buffalo all lead Single Effect Evaporator, 200 sq. ft., with all accessories.

1—600 sq. ft. all copper Single Effect Evaporator or Calandria Pan with Barometric Condenser, Jet Ejector and all accessories.

1—42" x 42" Shriver, cast iron, plate & frame Filter Press, side feed, open delivery, 41 chambers, self-contained hydraulic closing device.

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Season's Greetings

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ABSORBER
HCL Alberger, comp. unit made of Karbate for 10-ton/day plant (UNUSED).

AGITATORS
Patterson, vert. Unipower 10 HP, X.P. motor, 56 RPM output.
Simplex Turbo 34" belt drive

AUTOCLAVE
Jack'td. 6'x8', S.S. Clad, 40# WP, ASME.

BLENDERS
Copper, 20" dia., 20" deep, conical, M.D.
Conical, S.S., 7'8"x10'.
Porter-Cable Double Cone, S.S., 26"x28".
Gedge Gray, 3'6"x10'.

BLOWERS & FANS
10000 CFM, 1.9" SP, Everdur Blades.
18000 CFM, 7¾" SP, Type SE, No. 12.
70000 CFM, 10" SP, Sturt., Turbo #2.
15000 CFM, ½" SP, Type ME, Size 27.
53000 CFM, 1¼" SP, Type ME, Size 49.
(Other Blowers from 1000 to 50000 CFM)

BOILERS
Dowtherm, 500,000 BTU, 125# pressure, Natl. Board, gas fired.

COMPRESSORS
L.R. Centrifugal, 4 stage, single flow, 6500 CFM, 10#, M.D. (unused).
Frick, Ammonia, 4x4, Type G.

CONDENSERS
Karbate, 6"x60".

CONVEYORS
Stainless Steel belt 32"x65' cc.
Link Belt, flat, 24"x30' cc.
Rapids-Standard Portable, 16"x15', Mod. RPB-C-15-16, complete.

CRUSHERS & MILLS
Abbe, 4-cage, 22"x12".
Abbe, Size B, Grinder.
Micro No. 2 Hammermill.
Williams Hammermill No. 3.
Jeffrey A2, 36"x24", Swing Hammer.
Stedman Mill, 4-cage, 36".
Day, Paint Mill, 3-roll, 16"x40".
Abbe Ball Mill No. 150, 3'7"x3'8".
Abbe Ball Mill, 38"x38".
Ball Mill, 5'x6', chrom-mang. Type DJX.
Ball Mill, 6'x16', chrom-mang. 50# W.P.

ELEVATORS—BUCKET
Webster 48' MI Buckets 14"x7".
Jeffrey 68' MI Buckets 10"x6".

FILTERS
5'4"x6' Oliver, continuous, wood drum.
8'x10' Oliver, continuous, wood drum.
8'x10' Oliver, precoat bronze drum.
8'x10' Oliver, continuous, all iron.
Sweetland No. 12, 72 leaves, 2" spacing.
Shriver 36", 50 Celoron Plates & Frames.

GAS PURIFICATION SYSTEM
Complete with tanks, valves, piping. Cap. 2000 to 16,000 cu. ft. per hour.

KILNS & DRYERS
8'x125'x⅝" Vulcan.
7'x45'x1½" Link Belt.
5'x50'x7/16" Mosser.
4'x30'x⅜" Traylor.
3'10"x16' L.B. Roto Louvre.

MIXERS
No. 3 Super Ajax, 173 gals.
Type E, Size 2, Champion, 110 gals.
1½ SA Readco, 88 gals.
Blystone, heavy duty, 4'x6'7".
W. & P. Kneader, 33"x40"x30".

PUMPS
Centrifugal—from 20 to 2,500 gals.
Vacuum, Stokes, 212C, 100 CFM.
Nash Hytor #4.

REDUCERS
¼ to 100 HP. Ratio 4-1 to 2064-1.
1 to 7½ HP. Vari-Speed, 2-1 to 6-1.

TANKS
2300 gal. hor. 5'x15'2"x½".
3000 gal. hor. 6'6"x10'x5/16" ASME.
3200 gal. hor. 6'3"x14'2"x¾", glass lined and insulated, for syrups, food products.
3200 gal. vert. 8'x8'x5/16".
4000 gal. hor. 6'6"16'x¼" & 5/16".
4000 gal. hor. 6'x20'3"x5/16". (NEW).
4900 gal. vert. 10'x6'x5/16".
5000 gal. hor. 6'1"x24'x½".
5200 gal. vert. 9'5"x10'x¼".
25000 gal. rubber lined 13'x25' UNUSED.

Heat and Power Co., Inc.
70 PINE STREET — DIGBY 8-0373 — NEW YORK 5, N. Y.

Mikro-Pulverizers
1—SH stainless, 2-TH, 3-TH, 4-TH

Quaker City Hammer Mills—#20, #21
Febble Mills—18"x27"—30"x30"—36"x48"—54"x60"—6'x5'—4'x15'
Steel Ball Mills—42"x14' & 9'x7'
Hardinge Mills 3'x3', 6'x22" ball.
Tube Mill—5'x22'
Jaw Crushers—unused Al Ch. 7x9 Dodge—9x15", 10x20—14x36, 24"x36"
Roll Crusher Sturtevant 10"x10" smooth
Rotary Kiln, 54"x30'—5'x40', 5'x50'—6'x85' indirect
Dry Pan—Chambers 5'—unused
Blowers—Spencer 150 CFM/24 oz. 400 CFM/10 oz. Amer. Exh. 400E—50EE5—w/ motors—others in stock
Speed reducers, Pumps, conveyors, lift trucks 1—10000# 74" lift.
7000 steel pallets—9¾" & 11"x42", galv. rolled edge.

Send For Stock List

LAWLER COMPANY
METUCHEN, N. J.

FOR SALE

1—New, never used, Iron Fireman 24PB Pneumatic spreader stoker with all controls.
1—New Mojonnier tubular heat exchanger—Model 96-S. Stainless steel jacket. Capacity 22,000 lb. skim/hr.—45°—170° F. 96—18/16 I.D. Tubes—5 ft. long. Includes panel board, instruments, valves, etc.
1—Model W-49 Sta-Vac heater—stainless steel—40,000 lb./hr.—60°—160° F. Complete with pump, relief valve, gauges, etc.
1—Union Steam Pump viscolizer—450 g.p.h.—stainless steel sanitary head. Enclosed frame—with 20 HP. motor.
1—6 ft. Rogers copper vacuum pan—4000 lb./hr. and Byers barometric condenser—two 750-gal. hotwells.
2—6-truck dryers. 25—1" x 29" x 36" vitreous enamel trays per truck. Complete with motor and controls—12' W x 8' D x 10' H.
1—14-truck dryer. 15—1" x 29" x 32" trays per truck—complete with motor and controls—19' W x 7' D x 10' H.
1—Vacuum roll dryer—single roll—30" D x 30" L—with 3 receiving trucks.
3—Sperry filter presses—size 35—type 31—open delivery—corner feed.
9—Swenson-Walker crystallizers—2' W x 10' L x 2' D—280 gal. capacity. Jacketed—with two 7½ HP. motors.
1—Worthington Monobloc pump—250 g.p.m.—74 ft. head—10 HP—1080 r.p.m.

WYETH INCORPORATED
R. O. Phillips — Muson, Michigan

FMC

TIME TO TAKE INVENTORY

Not only of your end product but also of your productive equipment. What will you need in 1950? What units shall be sold? FMC holds the answer to both problems.

CHOICE SELECTIONS from STOCK

Stock Number	Description
2000	Farrel 3 Roll Calendar; friction type; 18"x54"
2487	Stokes R3 Ceramic Type Tablet Press with motor
2529	Colton Type 5AT Bushing Press; motorized
2529W	Colton Type 9-18 Rotary Tablet Machines; motorized
2675	Stokes Model DD Rotary Tablet Press
2186	3 Stainless Steel 800 gal Jacketed Tanks
2879	5 S.S. Vac. Pans; Jacketed and Unjktd.; 3'x3' to 5'x8'
2540	Mojonnier Copper Vac. Pan; 6'x16' with calandria
2005	Vulcan Copper Rectifying Column; 2'x36"; 50 plates
2966	Zaremba Triple Effect Evaporator with auxiliaries
2062	Pfaudler 2800 Gal. Vac. Pan with Stainless Coils
9903	Two Aluminum and Copper 150 Gal. Vacuum Pans
2416	NEW 150 Gal. Stainless Jacketed, Agitated Kettle
2530	Bartlett & Snow Stainless Pan Dryer; 6'x3' complete
2755	Alberger Karbate Hydrochloric Acid Recovery System
2897	Stokes Freeze-Dry System, including No. 138N Vac. Dryer
2877	Buffalo Atmospheric Double Drum Dryer; 32"x72" complete
2499	Stokes Rotary Vac. Dryer; 3'x5' with nickel contacts
2729	Oliver United Dorrco Type Rot. Vac. Filter in Nickel
2192	Oliver Rot. Vac. Filter in Steel; 6'x44"
2789	Shriver 30" Cast Iron, Open Delivery Filter Press
2886	6 30" Cast Iron, 45 Chamber Open Delivery Filter Presses
2895	Tolhurst Stainless 12" Centrifugal Extractor; with 1/3 H.P. Motor
2901	A.T.&M. Monel 30" Centrifuge
2854	Sharples Centrifuge MLP8
2927	Porter 11,000 lb. Dry Powder Mixers; 370 cu.ft. NEW
2836	Wolf 4000 lb. Dry Ribbon Mixer
2919	Screw Press, 12"x3'; 5 H.P. motor
2755	Two Curb Presses; 18"x36"; 24"x36"
2487	Five Day Ro-Ball Sifters; 40"x120"

Equipment Still on Location

3 S.S. 5000 Gal. Closed Tanks; Indiana
2 Rotary Vacuum Dryers; 7'6"x20'; N. J.
3 Harsey Monel Dryers; 6'x33'; Ohio
2 Louisville Steam Tube Dryers; 6'x25'; Ohio
Proctor & Schwartz Apron Type Dryer or Agar; S.S. Apron 90"x32'; Conn.
Device Vac. Shelf Dryer; No. 23; S. C.
3 NEW Sperry 42" Alum. Filter Presses; Ind.
4 Louisville Screw Dewatering Presses; Ohio
Porter 4000 lb. Stainless Tumbling Mixer; N. J.
2 Patterson Chrome Manganese Lined Ball Mills; 5'x5'; 6'x10'; N. J.
8 A.T.&M. 60" Stainless Centrifugals with Vac. and Pressure Tight Cortes; Conn.

FIRST MACHINERY CORP.
157 Hudson Street,
New York 13, N. Y.

CHOICE ITEMS — BUY BRILL

10—Ross Esq. 2-truck Atmospheric Dryers, steam heated, 500 sq. ft.
2—Proctor & Schwartz 10 and 6 section single conveyor Dryers.
3—Louisville 6'x50', 6'x40', 6'x25' Rotary Steam Tube Dryers.
2—Bullovak 5'x12', 5'x4' Atmospheric Single Drum Dryers.
2—Bullovak 48"x40", 24"x20" Vac. Drum Dryers.
3—Devine, Stokes 30"x8', 4'x20', 5'x30' Rotary Vac. Dryers.
1—Ruggles-Coles 70"x35' ind. heat Rotary Dryer.
6—Allis-Chalmers 9'8"x250', 7'6"x125', 9'x80', 6'x42' Rotary Kilns
1—Devine 3'x14' stainless clad Rotary Dryer.
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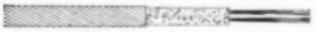

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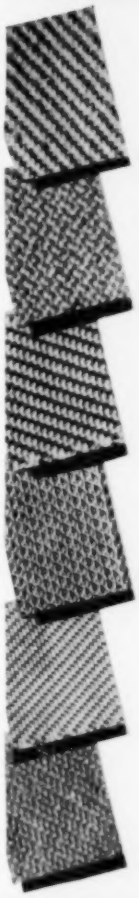

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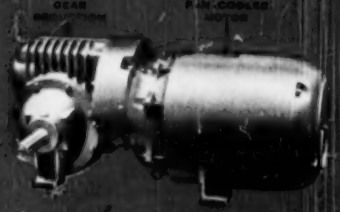

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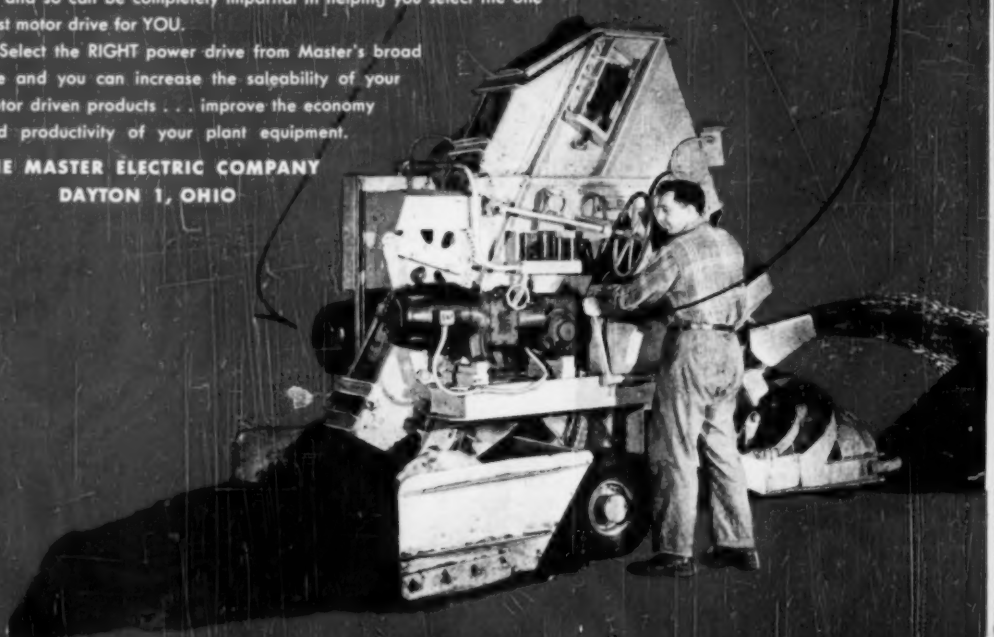

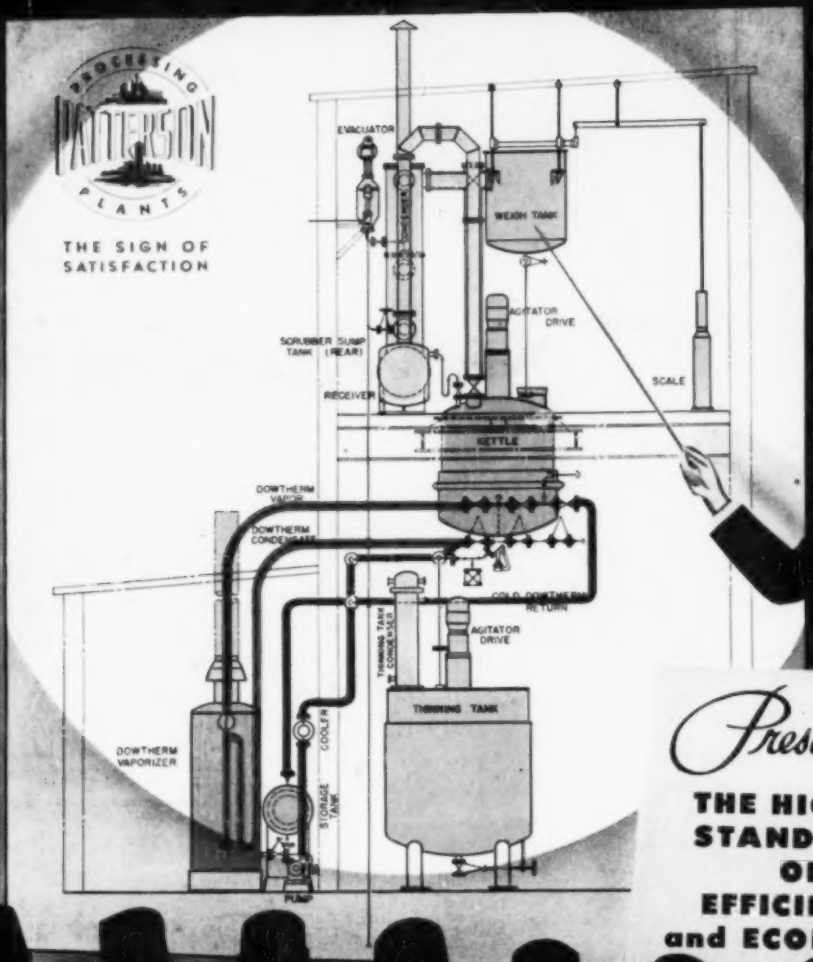

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